DOCUMENT RESUME

ED 147 630 CE 014 115

AUTHOR	Micklus, C. Samuel
TITLE	Airbrush Technology.
INSTITUTION	Rutgers, The State Univ., New Brunswick, N.J. Curriculum Lab.
SPONS AGENCY	New Jersey State Dept. of Education, Trenton. Div. of Vocational Education.
PUB DATE	Dec 77
NOTE	84p.
AVAILABLE FROM	New Jersey Vocational-Technical Curriculum Laboratory, Building 4103, Kilmer Campus, Rutgers University, New Brunswick, New Jersey 08903 ($4.00 plus postage)
EDRS PRICE	MF-$0.83 HC-$4.67 Plus Postage.
DESCRIPTORS	Commercial Art; Curriculum Guides; Design; Equipment; *Graphic Arts; *Hand Tools; Industrial Arts; *Learning Activities; Post Secondary Education; Secondary Education; *Technical Illustration; Technology; Vocational Education
IDENTIFIERS	*Airbrush Technology

ABSTRACT

To supplement and extend the offerings in the fields of industrial arts and vocational education, instructions in the use of the airbrush in design oriented activities are presented in this manual. It is written for and directed to the following types of programs: (1) high school--drafting, graphic arts; (2) vocational school--drafting, commercial arts, graphic arts; (3) junior college/technical institute--drafting, technical illustration, graphic arts; (4) college (industrial arts)--drafting, graphic arts, photography, industrial design; (5) college (technology)--drafting, manufacturing, design, graphic communication; (6) college (art)--design, advertising, illustration. The eleven sections cover (1) introduction to the airbrush, (2) equipment and materials, (3) preparing the drawing, (4) preparation of equipment, (5) techniques of operation, (6) practice exercises, (7) rendering basic shapes, (8) cleaning and maintenance, (9) errors, (10) rendering problems, and (11) tips for the classroom teacher. Instructions and descriptions in each section are accompanied by graphic illustrations. (BL)

****
* Documents acquired by ERIC include many informal unpublished *
* materials not available from other sources. ERIC makes every effort *
* to obtain the best copy available. Nevertheless, items of marginal *
* reproducibility are often encountered and this affects the quality *
* of the microfiche and hardcopy reproductions ERIC makes available *
* via the ERIC Document Reproduction Service (EDRS). EDRS is not *
* responsible for the quality of the original document. Reproductions *
* supplied by EDRS are the best that can be made from the original. *
****

ED147630

State of New Jersey
Department of Education
Division of Vocational Education

AIRBRUSH TECHNOLOGY

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
Philip L. Edgecomb
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) AND THE ERIC SYSTEM CONTRACTORS."

Dr. C. Samuel Micklus, Associate Professor
Glassboro State College
Glassboro, New Jersey

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

CE 014 115

Vocational-Technical
Curriculum Laboratory
Rutgers – The State University
Building 4103 – Kilmer Campus
New Brunswick, New Jersey

December 1977

NEW JERSEY DEPARTMENT OF EDUCATION

FRED G. BURKE, COMMISSIONER

RALPH H. LATAILLE, DEPUTY COMMISSIONER

DIVISION OF VOCATIONAL EDUCATION

WILLIAM WENZEL, ASSISTANT COMMISSIONER

JOHN E. RADVANY, DEPUTY ASSISTANT COMMISSIONER

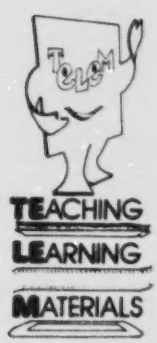
HAROLD R. SELTZER, DEPUTY ASSISTANT COMMISSIONER

JOSEPH F. KELLY, DIRECTOR,

BUREAU OF OCCUPATIONAL AND CAREER RESEARCH DEVELOPMENT

FREDERICK L. CAPPELLO, DIRECTOR,

VOCATIONAL CURRICULUM AND MEDIA DEVELOPMENT



RUTGERS – THE STATE UNIVERSITY

PHILIP L. EDGECOMB, DIRECTOR (Acting),

NEW JERSEY VOCATIONAL-TECHNICAL

CURRICULUM LABORATORY

RUTGERS – THE STATE UNIVERSITY

BUILDING 4103 – KILMER CAMPUS

NEW BRUNSWICK, NEW JERSEY

AIRBRUSH TECHNOLOGY PROSPECTUS

The aim of this book is to supplement and extend the offerings primarily in the field of Industrial Arts and Vocational Education by including the use of the airbrush in design oriented activities. It is assumed that a person using the text has no knowledge of the function, capabilities, potential, or use of the airbrush. The abilities you can develop are limited to your own potential. It is written at a level acceptable and pertaining directly to the following types of programs:

HIGH SCHOOL – Drafting; Graphic Arts

VOCATIONAL SCHOOL – Drafting; Commercial Arts; Graphic Arts

JUNIOR COLLEGE / TECHNICAL INSTITUTE – Drafting; Technical Illustration; Graphic Arts

COLLEGE (Industrial Arts) – Drafting; Graphic Arts; Photography; Industrial Design

COLLEGE (Technology) – Drafting; Manufacturing; Design; Graphic Communication

COLLEGE (Art) – Design; Advertising; Illustration

TABLE OF CONTENTS

	Page
Airbrush Technology Prospectus	i
I. Introduction to the Airbrush	1
II. Equipment and Materials	3
Airbrush	3
Air Supply	4
Air Pressure Regulator	6
Air Hose	6
Materials	7
III. Preparing the Drawing	11
Selection of Stock	11
Cutting the Stock	11
The Drawing	12
Protecting the Working Surface	13
IV. Preparation of Equipment	14
Airbrush	14
Pressure Regulator	15
Air Hose	15
Procedure for Turning on Air	16
V. Techniques of Operation	18
Preparing to Paint	18
How to Hold the Airbrush	20
Operating Principle	20
Preparing the Drawings	22
How to Spray	22
Frisket Paper	25
VI. Practice Exercises	29
Exercise 1	29
Exercise 2	30

Exercise 3 31
Exercise 4 32

VII. Rendering Basic Shapes 33

Problem #1 – Graduated Tone Chart 33
Problem #2 – Rendering the Cylinder 36
Problem #3 – Rendering the Pyramid 41
Problem #4 – Rendering the Cube 44
Problem #5 – Rendering the Cone 47
Problem #6 – Rendering the Sphere 49

VIII. Cleaning and Maintenance 51

Everyday Cleaning Procedure 51
Maintenance – Needle, Tip, Head 54
How To Clean Color Cup 57
How To Replace Valve Washer 58

IX. Errors 59

X. Rendering Problems 62

Procedure 62
Shading 63
The Vibration Eliminator 68
The Glue Drain Spout 72

XI. Tips for the Classroom Teacher 74

I – Introduction to the Airbrush

The airbrush is used most extensively in the graphic arts industry. By producing unique effects which cannot be duplicated in any other way, it serves as an indispensible instrument for retouching photographs. Among the most frequent users of the airbrush are commercial artists, technical illustrators, and designers.

The principal types of airbrush work are photo retouching and rendering. Renderings are realistic representations of a product or object. They may show an exterior view, an exploded view, or a cut-a-way view illustrating an internal parts breakdown. Photo retouching alters a photograph prior to reproduction by a printing process. For instance, blemishes may have to be removed, highlights and shadows added or taken away, and any other requirements necessary to make the photograph an effective illustration.

The airbrush is a precision instrument approximately the size of a fountain pen. It is operated by a source of compressed air. The air is supplied through an airhose to the airbrush and controlled by the front lever, or operating button. See Fig. 1.1.

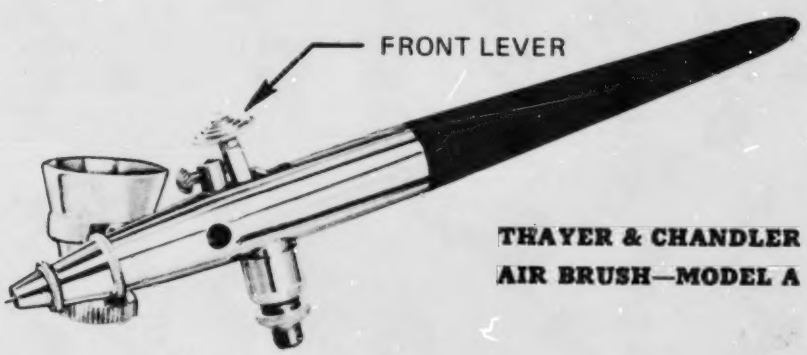


FIG. 1.1

Several less expensive airbrushes do not have a front lever which allows the artist to vary or control the amount of paint. When depressed, the air and paint flow at a constant setting. This is a limiting feature and not recommended for classroom use or for the individual who is seriously trying to master airbrushing skills.

The principle of operation is that liquid paint is atomized and deposited on a desired area. The compressed air creates a suction which draws the paint from an attached cup and atomizes it into a spray. This spray consists of minute particles of pigment carried by the airstream.

Airbrushing is a skill acquired by diligent practice and a desire for perfection. The beginning student should improve with each lesson. To be a good airbrush artist, one must gain complete control of the instrument. This is achieved by developing the coordination and controlling the flow of air and paint at proper distances for desired effects. As in many skills, concentration and practice are necessary to achieve a high degree of competency.

Many rewarding opportunities are available for competent airbrush artists. Employment is offered by government and industrial concerns which produce technical literature. Advertising agencies, newspapers, various types of printing companies, art service firms, and manufacturers often employ full time airbrush specialists. Often technical illustrators and commercial artists have other primary duties, but they are occasionally called on to use an airbrush. Airbrush artists are often used on a free lance basis by numerous industrial firms. Some of these include: photoengravers, photographers and small to medium sized printing companies, advertising agencies, and various manufacturing companies.

II – Equipment and Materials

For the convenience of those who must purchase equipment and materials from separate accounts, the various items are categorized accordingly.

Equipment

The following equipment is necessary and explained in detail:

A. Airbrush(s)
B. Air Supply(s)
C. Air Pressure Regulator(s)
D. Air Hose(s)

A. Airbrush

1. Selection

Selecting an airbrush is an important step in setting up a successful program. There are several manufacturers with various types of airbrushes available. Three general types of airbrushes are:

a. The *pencil type* (Fig. 1.1) is recommended for classroom use since it is the best all-around, durable, and most widely used airbrush.

b. The *poster type* is a large, heavy duty brush about twice the size of the pencil type. It is used for larger work such as large posters, displays, etc.

c. The *oscillating needle type* operates by an air turbine. It has the ability to produce finer lines and dots. It is more expensive and designed for doing more detailed work than that required of the beginning student. As one becomes more advanced, it may be considered on an individual basis.

2. Manufacturers

There are several manufacturers of airbrushes. Some recommended manufacturers and their models recommended for classroom use are:

a. Thayer and Chandler, Model A

b. Wold, Model A-1, A-2

c. Paasche, V-2

d. Badger, Model 100 IL. Recommended that Model IL be purchased for classroom use instead of Model 100 XF. The head and needle of the Model 100 XF is interchangeable with the Model 100 IL and can be purchased separately.

3. Quantity

The number of airbrushes needed will of course depend on the extent of the program offering. The ultimate learning situation would provide one airbrush per student. Since much of the time may be spent drawing, cutting, etc., one airbrush will very effectively serve two students. Airbrushing can be introduced with perhaps as little as one or two airbrushes, allowing students to use them on a rotation basis. It should be noted that two airbrushes can easily be used from each air supply and regulator.

B. Air Supply

There are several excellent sources of compressed air. The three types discussed are the carbonic gas outfit, the compressor, and a central plant system.

1. The Carbonic Gas Outfit

FIG. 2.1

A most desirable air supply system is the carbonic gas outfit or the CO_2 cylinders. It takes up little floor space, is safe, and operates very quietly. The cost of CO_2 cylinders varies in different localities. However, they are relatively inexpensive to rent. They are available in many appropriate sizes including 12, 20, and 50 lbs. The 20 lb. cylinder is a good size to begin with and will give many hours of service. Sources of suppliers for CO_2 are welding gas suppliers, fire extinguisher servicemen, and soda fountain supply houses.

CAUTION: 1. Because of their shape, CO_2 cylinders are not very stable. Wire the cylinders to a desk, wall, post or some other stable item as a safety precaution. 2. Use only CO_2. **NEVER** use oxygen, helium, or other inflammable gases.

2. Air Compressor

If an air compressor is purchased, several precautions should be taken. It must deliver a steady pressure and not pulsate. Some small compressors vibrate and move around the floor. This is dangerous because the V-belt can easily cut the air hose if allowed to come in contact with it. The compressor should be secured to avoid this situation. Most compressors are noisy, which makes them undesirable in a classroom.

There are many excellent compressors on the market designed expecially for airbrush use. They may be purchased through well-equipped art stores or school supply companies.

3. Central Plant

A central plant air supply system may be utilized if available. **CAUTION:** Atmospheric air contains moisture and dirt. In cities and large surburban areas, the air also contains oil and smog.

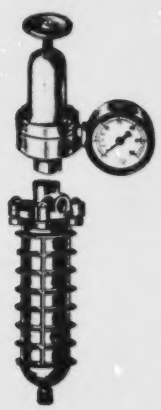


FIG. 2.2

This oil, water, and dirt must be trapped before the air reaches the airbrush. A filter (Fig. 2.2) should be installed with a pressure regulator and gauge to indicate the pressure passing through to the airbrush. **NEVER OPERATE AN AIRBRUSH WITHOUT CLEAN , DRY, REGULATED AIR.** The filter should have a drain valve to remove condensate and oil daily or as necessary.

C. Air Pressure Regulator

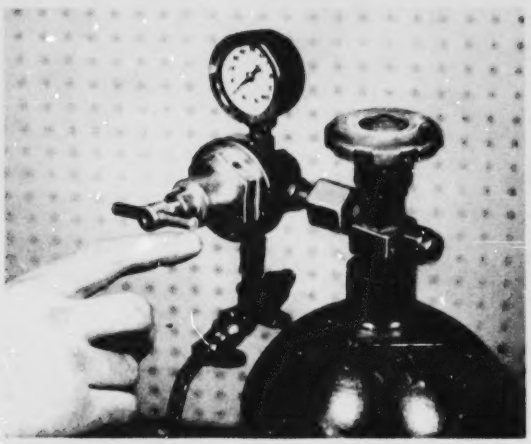


FIG. 2.3

The air pressure regulator (Fig. 2.3) is a most important piece of equipment and must be of a good quality. It must be capable of delivering a *constant pressure* up to thirty pounds.

The regulator may be purchased with a single- or a double-outlet cock. If the unit is used in a classroom, the double outlet is recommended because two airbrushes may be utilized from each regulator. If the airbrush is being used at home or office and one airbrush will be used at a time, then the slightly less expensive, single outlet is adequate.

D. Air Hose

The hose size is 5/32" inside diameter. It is recommended that the air hose be purchased complete with the couplings attached (Fig. 2.4). Be careful to order the correct fittings for the specific make of airbrush you are using. Hose connections are not all interchangeable between manufacturers. If you purchase the air hose, regulator, and airbrushes from the same dealer, you are less likely to have any mix-up in their sizes, etc.

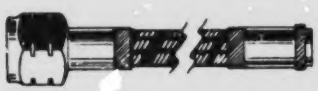
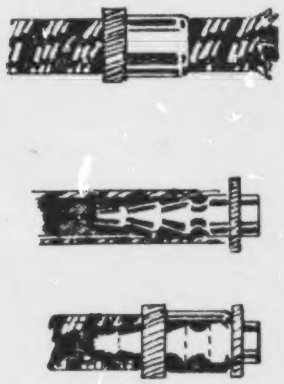


FIG. 2.4

Standard lengths of hose are 6', 8', and 10'. Larger lengths are available and usually require special ordering. An 8- or 10-foot length is recommended for classroom use.

If the hose is purchased without the connections, the directions for attaching the fittings are as follows:



1. Slip knurled end of hose ferrule over braided air hose.

2. Force end of hose connection into airhose.

3. Holding hose in left hand, turn and pull hose ferrule until tight against knurl on the hose connection.

FIG. 2.5

Materials

Some of the expendable materials needed may be acquired through a general school supply. The following list will give approximate quantities separately for classrooms and individuals. The quantities may vary depending upon usage:

EXPENDABLE MATERIALS	QUANTITY	
	SCHOOL	INDIVIDUAL
4H pencil	1 per student	1
Kneaded eraser	1 per student	1
White, illustration board, 20" x 30", single thickness, medium surface	25 per 20 students	3
Drafting tape, ½"	3 rolls	1 roll
Rubber cement, Best Test	1 gallon	½ pint (with brush)

EXPENDABLE MATERIALS	QUANTITY	
	SCHOOL	INDIVIDUAL
Rubber cement, thinner (Bestine)	1 gallon	1 pint
Tracing paper, vellum, roll or pad	1-2 sheets per student	1-2 sheets
Photo retouch grays (optional)	1 set	1 set
Construction paper or mimeo paper	1 ream	25 sheets
X-acto knives #11	4 packages	1 package
Prepared frisket paper roll, 18" x 6 yds.	3 rolls per 25 students	1 roll
Watercolor brus		
#00	6	1
#1	6	1
#3	6	1
#8	2	1
Water jars (baby food, jelly jars, etc.)	6	2
Eyedropper (optional)	2	1
Wire or rope to secure CO_2 cylinders		
Airbrush watercolors		
White	2	1
Black	6	1

Airbrush watercolors are available in jars, tubes, and small round cakes in plastic pans. The amount of paint will vary depending on the extent of the program. The suggested list of colors is in quantities of one-ounce jars as a beginning to be replaced as needed.

NON-EXPENDABLE MATERIALS	QUANTITY	
	SCHOOL	INDIVIDUAL
Watercolor pallets	4	1
Lead slugs or small flat weights	20	4
Pint rubber cement dispenser	3	xx
Pliers or adjustable wrench	1	1
2" x 4" x 6" wood for airbrush holder	1 per airbrush	1
X-acto knife #1	1 per work station	1
T-square	1 per work station	1
30°–60° triangle	1 per work station	1
Compass	1 per work station	1
Ruling pen	1 per work station	1
Airbrush reamer	1	1
Extra needle	1	1
Extra tip	1	1

NON-EXPENDABLE MATERIALS	QUANTITY	
	SCHOOL	INDIVIDUAL
Ellipse templates		
1 template of small ellipses ranging from 3/32" to 5/16"; 15° – 60°	1	1
If funds are limited:		
15°; 2 1/8" to 4"	1	1
20°; 2 1/8" to 4"	1	1
If funds allow:		
1 set 10° – 70° up to 2"	1	1
1 set 10° – 70° up to 4"	1	1

III – Preparing the Drawing

A. Selection of Stock

Several types of papers and boards are desirable for airbrushing. For the exercises described in Chapter 5, inexpensive paper such as mimeo, ditto, typing, or plain white drawing paper will suffice. When rendering, a much better grade of stock should be used such as illustration board or bristol board. Illustration board comes in many grades varying in cost, type, size, color, and thickness. It is impossible to discuss each available board. However, several considerations should be mentioned. A medium priced board is usually best for the beginner. Inexpensive boards have a less durable surface which mars when erased or tears when frisket paper is lifted. Since the board will be cut to smaller sizes, the cost per unit becomes greatly reduced. The most desirable stock for the beginning student is 20" X 30", single weight, medium surface, white illustration board. Bristol board or bristol paper is available in sheets and pads. The thickness of the bristol paper is available in sheets and pads. The thickness of the board is much less than that of illustration board requiring more care in handling. This trait may make this less desirable than the heavier illustration board. Bristol board is available in one-, two-, and three-ply weights. The two-ply board is recommended for the beginner. The working surface of bristol board is excellent for airbrush work.

B. Cutting the Stock

The illustration board or bristol board should be cut in such a way as to avoid waste. Fig. 3.1 suggests dimensions for the basic rendering shapes.

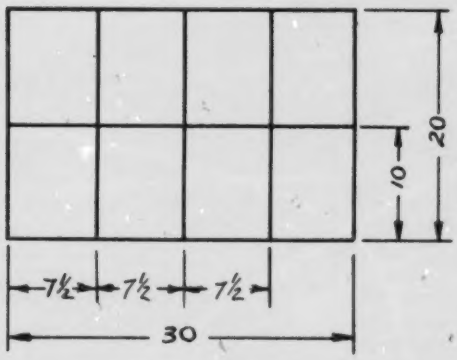


FIG. 3.1

One 20" X 30" board yields eight 7½"X10" pieces. Project No. 2, Tone Scale, Chapter 7, will vary from this dimension. The board is easily cut on a standard paper cutter and may be cut in advance to insure minimum waste. As one advances in airbrush work, any necessary adjustments in size of the working surface may be made.

C. The Drawing

Since airbrushing is a precise medium, attention is given to every detail. Emphasis must be placed on the accuracy of the drawing. All lines must be crisp, clean, and drawn precisely. All corners, radius, curves, etc. must meet perfectly. The airbrushed rendering will lose much of its effectiveness on a sloppy drawing. Drawn with a 2H or 4H pencil, the line weight should be that of a visible line on a mechanical drawing or approximately the thickness of the lines in Fig. 3.2.

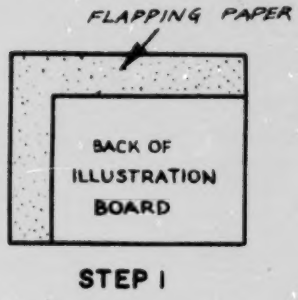
Avoid erasing unless absolutely necessary. If you must erase, be absolutely sure to remove any bits of eraser before airbrushing. If particles of the eraser remain on the board, the spray will fall on them leaving white spots when they are removed. A 'kneaded' eraser is excellent because it erases without breaking apart.

Unless you have experience in mechanical drawing, it is suggested that the student first draw the project on a plain white paper. If any part of the object is not carefully drawn, it should be repeated. This will help the final drawing to be executed properly. Fig. 3.2 illustrates the most common unacceptable errors.

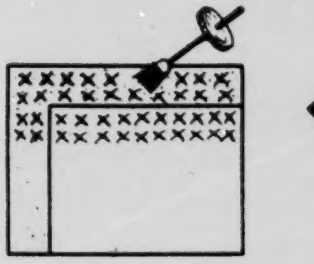
FIG. 3.2

D. Protecting the Working Surface

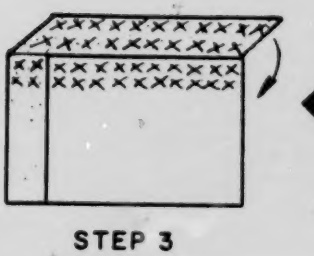
The surface to be sprayed must be handled carefully. Avoid touching the area as the natural oils from fingers may show after the area is sprayed. Prior to spraying or immediately after spraying, the rendering should be 'flapped' or covered with a piece of construction paper, cover paper, or inexpensive drawing paper. This will protect the airbrushed areas from being marred when handled or stored. The flapping procedure is illustrated in Fig. 3.3.



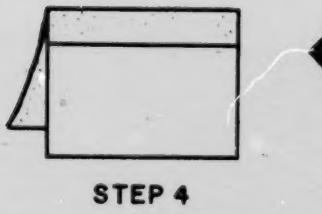
Step 1 Lay the illustration board face down on the construction paper, keeping the bottom and right side flush.



Step 2 Apply rubber cement to areas marked X and let both surfaces **DRY COMPLETELY.**



Step 3 Fold flap until both cemented areas touch and press firmly.



Step 4 Trim excess from left side and remove any visible rubber cement by rubbing with your fingertips or a rubber cement pickup.

FIG. 3.3

IV – PREPARATION OF EQUIPMENT

A. Airbrush

The airbrush(s) may be set up at a table in the front of a classroom or at adjacent desks. The instructor should be in a position to supervise those spraying as well as those at their drawing boards. The airbrush holder, which is supplied with each airbrush should be attached to a piece of wood approximately 2" X 4" X 8" with the screws included (Fig. 4.1).

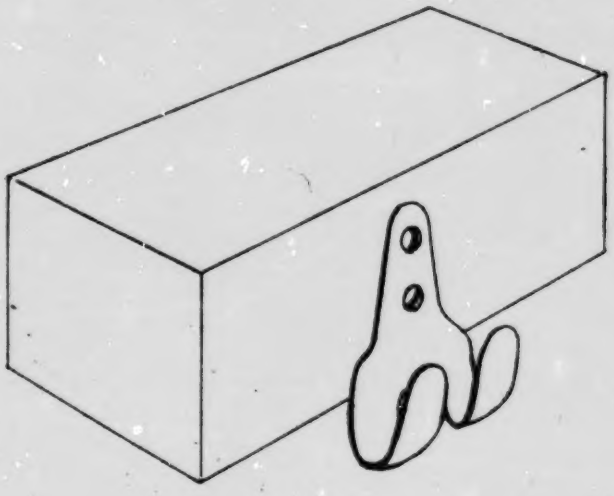


FIG. 4.1

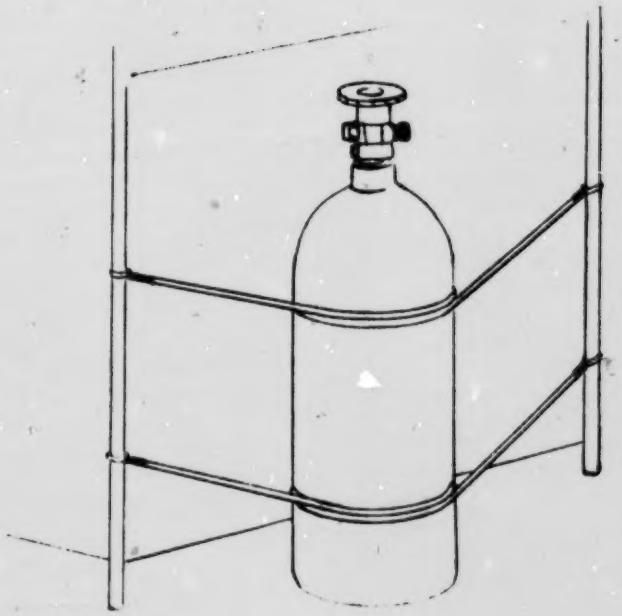


FIG. 4.2

The CO_2 cylinders should be placed out of the way of traffic, yet close to the airbrushing area. The tank should be fastened with a wire or strap to something stable to prevent it from being knocked over (Fig. 4.2). This can be accomplished by tying or strapping it to a table leg, building a stand or securing it to a wall.

B. Pressure Regulator

The regulator is fastened to the CO_2 cylinder at the cylinder attachment. Some cylinders require a washer (supplied with the regulator); others have a built-in washer. Your CO_2 supplier can tell you if his tanks require them. Place the washer in the cylinder attachment (Fig. 4.3) and fasten it hand tight to the threaded section of the cylinder. Use an adjustable wrench or pliers to tighten it to prevent air from escaping. This does not require a great deal of pressure.

FIG. 4.3

C. Air Hose

The air supply is transmitted to the airbrush by means of an air hose (Fig. 4.4). First attach the coupling to one of the outlet cocks of the regulator, hand tight. Tighten with an adjustable wrench or pliers to prevent air leakage. Once the hoses are attached to the regulator, they may be left on permanently. The hose end with the airbrush fitting must be attached with extreme care. The threads are extra fine and can be easily stripped. This step should be done by the instructor.

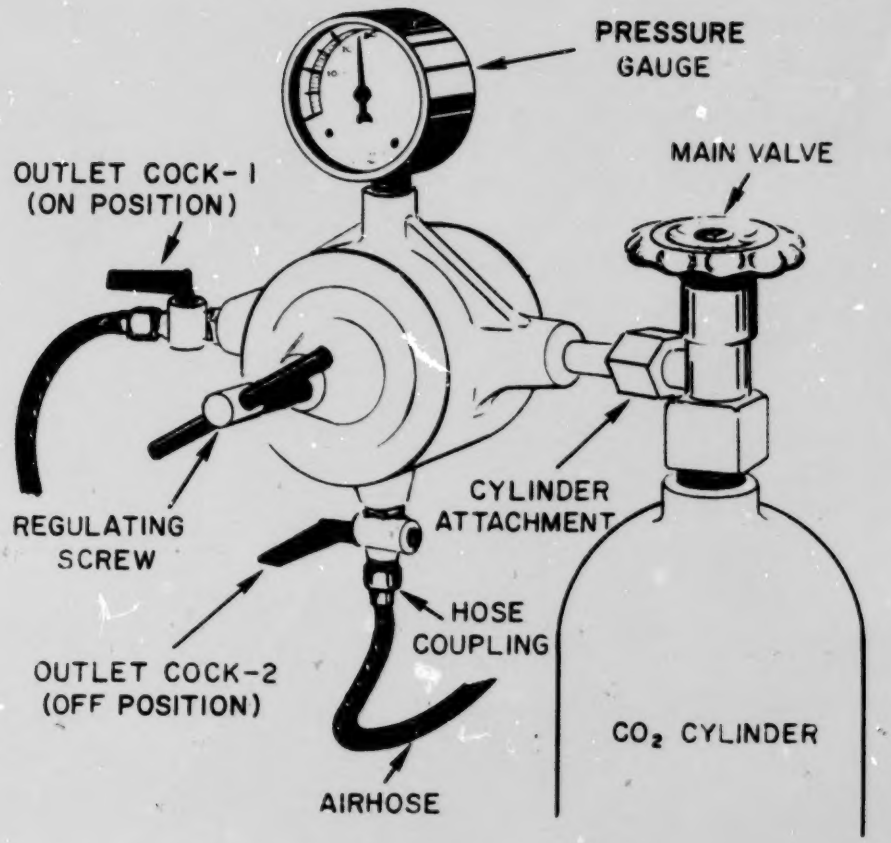


FIG. 4.4

D. **Procedure for Turning on Air**

Step 1 – Be certain that all valves are shut off. Outlet cocks are off when at right angles to the flow of air. The round shutoff valves are off when turned clockwise. In Fig. 4.4, the #1 outlet cock is shown in the on position and the #2 outlet cock is shown in the off position. The main valve is off when turned clockwise until tight. The regulating screw is turned counter clockwise until it is loose.

Step 2 – Open the main valve on the cylinder by turning it counter clockwise. Air has now reached the regulator.

Step 3 -- Turn the regulating screw clockwise until the pressure gauge reaches 28 lbs. Air has now passed through the regulator as far as the outlet cocks.

Step 4 – Open the outlet cock by turning the handle in the same direction as the flow of air. If the outlet cock has a round shutoff valve, open by turning counter clockwise. Air has now reached the airbrush. By depressing the front lever, air will be released.

Step 5 – Attach the paint cup to the side of the airbrush (Fig. 4.5). This is usually force fit requiring little pressure. The cup should be placed on an angle so that when it is held in the operating position or placed in the holder, the cup will be upright. The airbrush is now ready for use when paint is added.

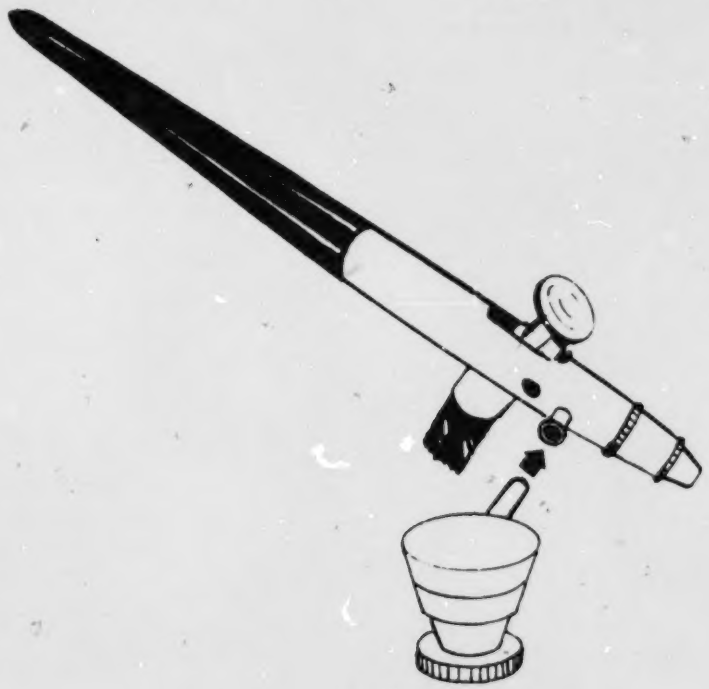


FIG. 4.5

V – TECHNIQUES OF OPERATION

Neatness

In the majority of cases, the airbrush is used to render an object or retouch a photograph, which in turn will be graphically reproduced by one of the various methods of printing or photography. The preciseness of the artist is required to make each new problem as complete in every detail as possible. The illustration, when finished, should communicate effectively what it is intended to depict. Therefore, it is to the artist's advantage to keep his working area as tidy as possible, keeping only the essential materials needed to complete the assignment. By keeping the working area clean, it reduces the chance of an accident which can be damaging to the work being done.

The paint being sprayed often covers a great deal more area than the beginner may be aware of. In a classroom, it is a good practice to cover the drawing board or working area with a piece of newspaper, wrapping paper, or some other large inexpensive paper. This will protect the drawing board or desk top from being sprayed. It avoids the chance of having another student's work become dirty accidentally. If any paint is left on the drawing board, although thoroughly dry, it is easily transmitted to T-square, triangles, or other drafting instruments; they may smear drawings. Always leave your working station clean and orderly as you would expect to find it in an industrial situation.

Preparing To Paint

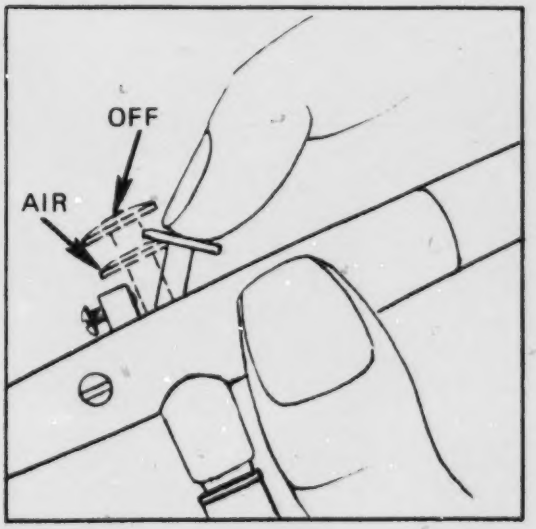


FIG. 5.1

After the airbrush has been set up and the regulator adjusted to 28 lbs. (Chap. 3, Preparation of Equipment), take a cup of clean, cold water and spray through the airbrush with the operating button depressed and all the way back (Fig. 5.1). In the classroom, a desirable method of preparing the watercolors for spraying is for the instructor to mix a few ounces of paint prior to class. Baby food jars or other wide mouth, stable jars are best. Prior mixing assures the beginning student of a good consistency of paint and

eliminates the chance of his placing a much too thick paint mixture, which is difficult to clean out. If the above method of preparing several ounces or a larger quantity is used, keep in mind that it is absolutely necessary to always use "pure paint". If you choose to use the same preparation for several days, it is necessary to filter your paint each day. This is easily done by straining your paint through a facial tissue into another jar (Fig. 5.2).

The paint may be easily transferred from the jar to the airbrush cup with an eyedropper or a clean artist #6 or #8 paintbrush. If the student is mixing his own paint, he should begin by putting a few brushfuls of paint on a pallet. He may then add water until he reaches the desired consistency. Then transfer the paint from the airbrush cup with the paintbrush or an eyedropper.

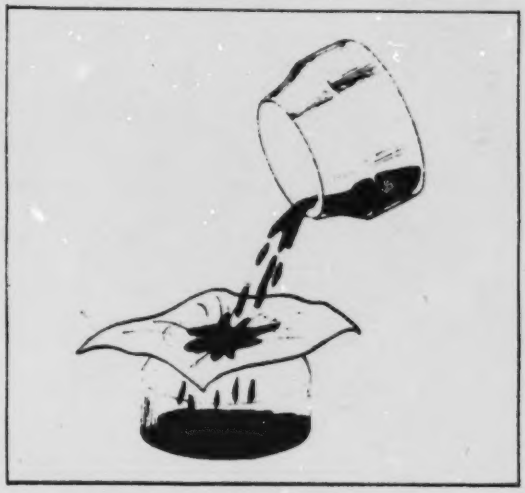


FIG. 5.2

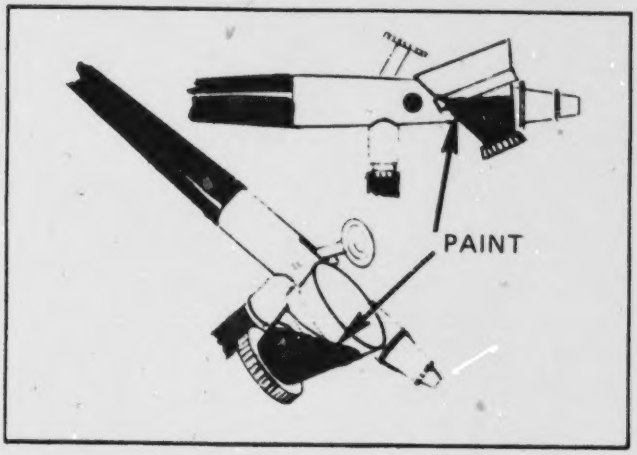


FIG. 5.3

The airbrush cup should be approximately $\frac{2}{3}$ full and fit onto the airbrush so that the paint doesn't spill out when held in the spraying position (Fig. 5.3).

Do not leave the paint on the pallet overnight. Grains may form and may cause clogging when transferred to the airbrush. Be sure the pallet is clean before beginning to work. To help insure that the paint will remain fresh, always keep the cap on the tube or the lid on the jar. It is not necessary to keep the lid on the jar of paint being used except for overnight or for extended periods of time during the day. Water can evaporate and leave the mixture too thick.

It is not recommended that the beginner mix his paint directly in the cup. As you become more advanced, you may do this by adding several drops of water to the cup; then add the color and spray. It is necessary to be able to judge the amount of water necessary to thin the paint to the desired consistency.

How To Hold The Airbrush

The airbrush should be held like a pen with the tip of the forefinger resting on the operating button. Loop the airhose over the arm (Fig. 5.4). This gives added protection from having the airbrush being accidently jarred loose and damaging a drawing, or knocked to the floor and broken. If someone bumps the airhose, the shock will be taken up in the forearm area. This position also keeps the airbrush hose out of the way of the artist and prevents it from interfering with free arm motion.

FIG. 5.4

Operating Principle

Both air and paint are released by the operating button. When pressure is exerted on the operating button, a button valve opens and releases the compressed air. When the pressure is removed, the valve closes. The illustration at the top left of Fig. 5-5 shows the operating button in the off and on positions. On some air brushes the needle extends beyond the tip when in the off position. If your airbrush has this feature, care must be taken never to allow the needle to be accidentally bent.

Press down on the operating button to release air (Fig. 5-5).

The amount of paint released is determined by the distance the operating button is pulled back (Fig. 5-5). Some less expensive airbrushes do not have this feature, and the button doesn't give any variance in the amount of paint released. These airbrushes are not recommended for the industrial arts classes due to this limitation.

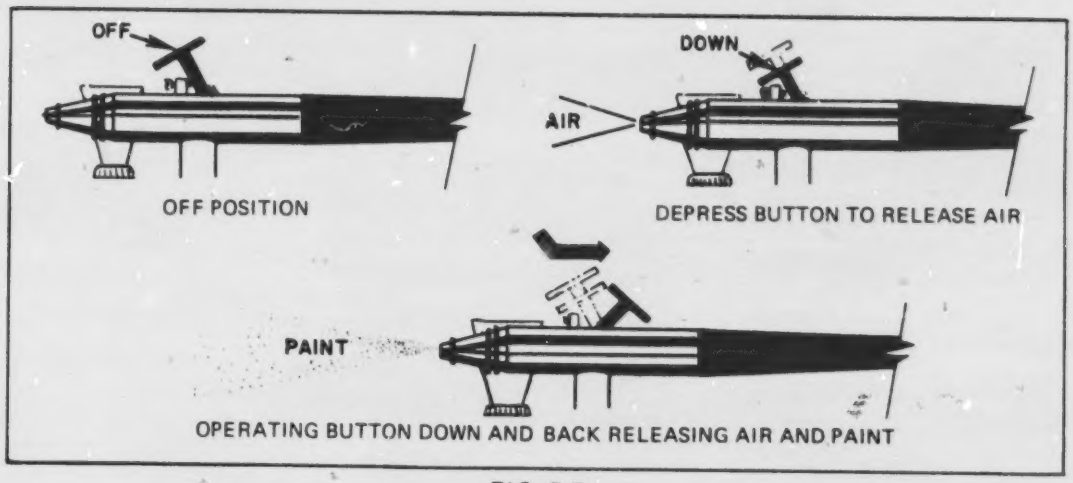


FIG. 5.5

The paint particles fan out in a cone shape from the tip. If the tip is close to the work, the color will be narrow and dense. As the distance increases between the tip and the work, the color becomes broader and diffuses wider.

Arm Movement

It is important to begin spraying correctly rather than developing a poor habit. As you spray, the movement of the brush is accomplished by moving the entire forearm from the elbow, not just the hand below the wrist. The artist should make several passes back and forth without air or paint to get the rhythm of the forearm motion while keeping an approximate constant distance of three inches from the paper.

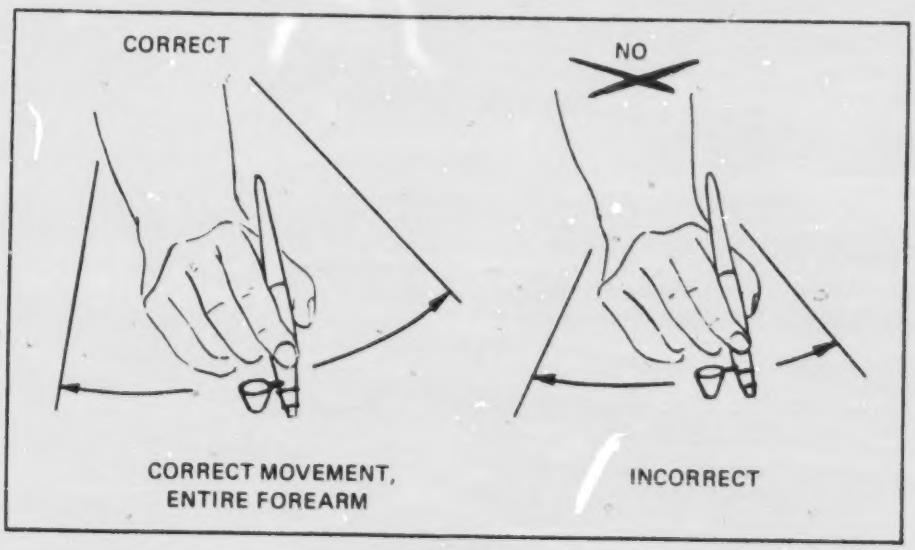


FIG. 5.6

Preparing The Drawings

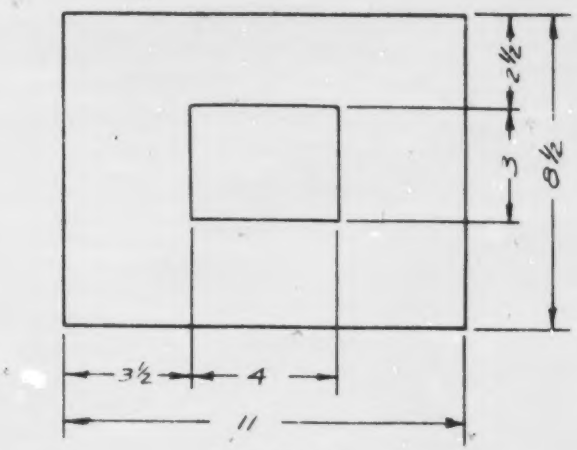


FIG. 5.7

Prepare two simple drawings for the first exercise with the airbrush. On each of two pieces of 8½"X11" plain white paper, draw a 3"X4" rectangle omitting the dimensions (Fig. 5-7). It is necessary to draw the rectangles with care to have accurate intersecting corners and neatly executed single lines.

How To Spray

Holding the airbrush approximately 3" away from the drawing, point the airbrush about 1½" to the upper left side of the drawing at (A) on Fig. 5-8. The airbrush should be held approximately 60° to the surface of the paper (Fig. 5-9). Press down on the operating button releasing the air; then pull back slightly to release a very small flow of paint. A common error for the beginner is to allow too much paint to flow at this point. As the airbrush is moved back and forth, there is a moment of hesitation before the stroke is returned. This causes a buildup of paint at the end of each stroke (Fig. 5-10). These are commonly called *dumbells*. Because of these, it is necessary to begin and end your stroke outside the drawing so that the even tone is maintained within the rectangle.

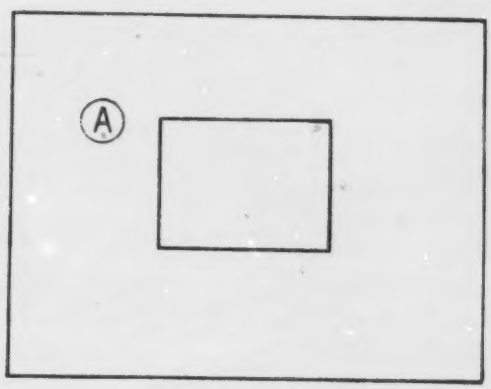


FIG. 5.8

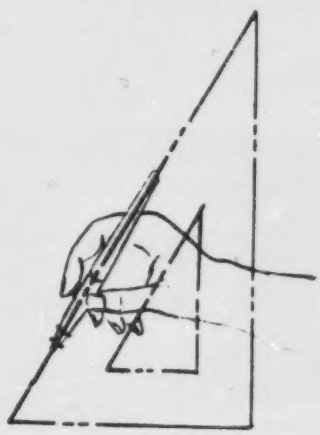


FIG. 5.9

Occasionally when ending a stroke, a slight bit of paint will remain in the tip of the airbrush. At the next depression of the operating button this excess paint will come out in a 'spatter'. This will do no harm if you are sure to begin your stroke beyond the rectangle or merely point the airbrush to a scrap piece of paper and depress the operating button for an instant.

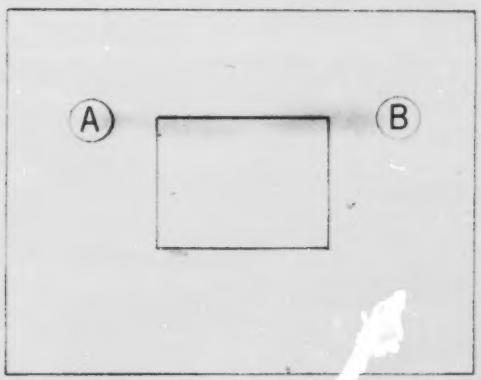


FIG. 5.11

Move the airbrush from point 'A' to point 'B' approximately 1½" to the right of the rectangle (Fig. 5-11). Lower the airbrush to point 'C' and move to point 'D' (Fig.5-12) overlapping stroke AB. Again, lower the stroke to point 'E' and move to point 'F' (Fig. 5-12) and continue overlapping and repeating until the entire rectangle is covered.

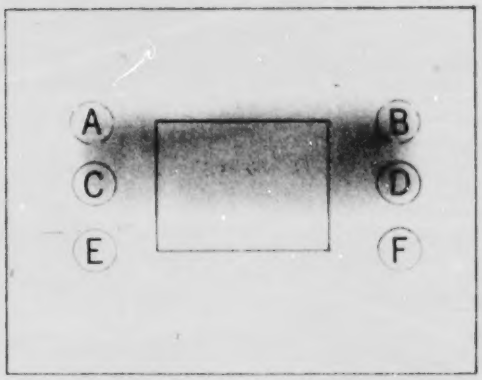
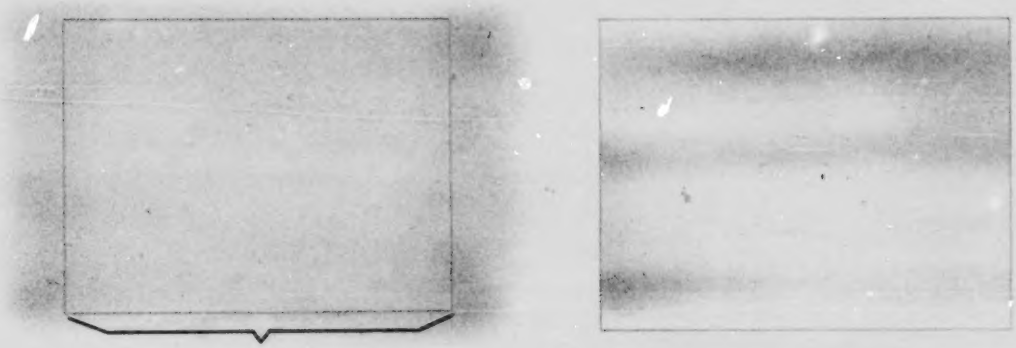


FIG. 5.12

Many strokes are required to cover the rectangle. If, when finished, you desire to have the rectangle a darker tone, repeat the entire process beginning at point 'A' until the desired tone is achieved.

The exercise at this point will look sloppy at first glance. However, remember that the *only* area of concern is that *within the rectangle*.

The instructor or student may cut a rectangle 3"X4" from a plain white piece of paper and place it over the work to eliminate the dark, uneven areas outside the rectangle from view. At this point, check the rectangle for streaks and uneven areas (Fig. 5-13).



AREA OF CONCERN IS ONLY WITHIN THE RECTANGLE

CHECK FOR EVEN TONE (NOTE STREAKS ABOVE)

FIG. 5.13

Frisket Paper

Frisket paper is used to mask out the areas which the artist wants protected from being sprayed. There are two types of frisket paper, prepared and unprepared. Unprepared frisket is a thin, tissue-like paper to which the user must add a very thin coat of rubber cement. When the cement dries, it is ready for use.

Prepared frisket is transparent and has its adhesive side protected by a backing sheet of waxed or glassine paper. Prepared frisket is more expensive, but much more convenient for classroom use. In industry, the great percentage of costs of airbrush is labor costs. Although the material is expensive, it becomes negligible on the overall service. In the classroom, the situation is reversed as no labor costs are figured and the material cost becomes significant.

Instructions come with frisket paper and it is good practice to read any special recommendations made by the manufacturer for his specific product. Generally the following instructions are typical.

1. Cut the amount of frisket paper from the roll or sheet necessary to protect your work.

2. Remove the thin frisket paper from the heavier backing sheet and allow it to air-dry for approximately one minute. Separate only that frisket to be used immediately.

3. Place the frisket over the drawing and rub it lightly in a circular motion from the center to the outside. Try to eliminate all air bubbles under the frisket, especially where it is to be cut. (This step is also used for unprepared frisket after the rubber cement has been added.)

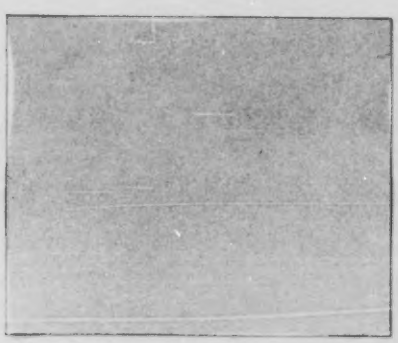
FIG. 5.14

The edge of the frisket paper has an uncoated section for ease of separation. When frisket paper is cut into small pieces, it is sometimes difficult to separate. A small diagonal cut on the edge will allow the paper to be separated easier (Fig. 5-14). Remember the frisket paper is the very thin, onion skin-like paper, not the heavier wax paper. Avoid having the adhesive side of the frisket come in contact with itself; it will stick and may lose some of its adhesive when separated.

Cutting frisket paper requires extensive care. Accuracy in cutting is important when preparing a rendering. A sharp blade is absolutely necessary. A #11 X-Acto knife is excellent and will last a long time. A piece of double-edge razor blade makes a good cutting edge if mounted in an X-Acto knife handle or taped to a wooden dowel.

The frisket must be cut exactly on the line of the illustration (Fig. 5-15). The slightest error will become obvious after spraying. It is best to do all cutting freehand in the beginning. Avoid using plastic angles, T-squares, etc.

CORRECT CUT



SLOPPY CUT

Frisket paper is very thin and requires little pressure to cut. Care must be taken not to damage the paper or illustration board on which the original drawing is made. In the case of the drawings on plain white paper, the artist must be careful not to cut through both the frisket and the paper with the illustration. Be sure that all corners are cut clean. It is safer to overlap the cuts slightly (Fig. 5-16) to eliminate the possibility of a tear when you remove the frisket from the area to be sprayed. Replace the frisket on its backing paper to be used again if necessary.

Due to expense, frisket paper should be used conservatively. If the frisket used doesn't cover the entire area to be protected, a mask of construction paper or similar paper is necessary to protect those areas not protected by the frisket. The mask is made by cutting an area out of the center approximately ½" larger than the drawing on each side. Flat weights such as lead slugs are used to hold the mask in place while airbrushing. If lead slugs are not available, drafting tape may be used. However, this adds to the overall cost of materials.

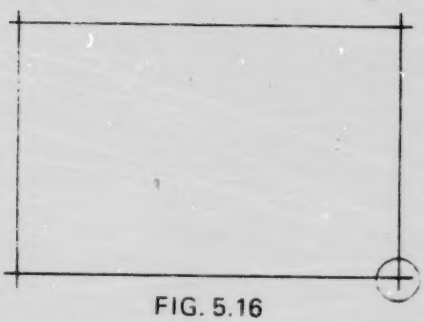


FIG. 5.16

FIG. 5.17

The Second Drawing

Using the frisket paper technique, take the second 3"X4" rectangle and repeat the first exercise. After the desired tone is reached, carefully remove all frisket. Check the drawing for streaks (Fig. 5-19), uneven tones (Fig. 5-20), uneven cuts (Fig. 5-21), etc.

FIG. 5.18 CORRECT

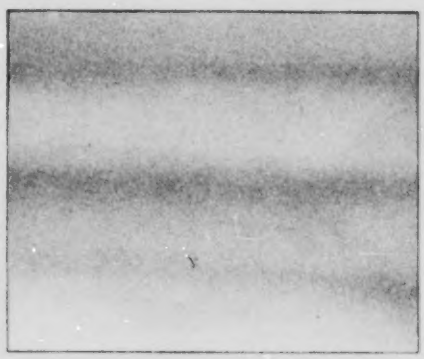


FIG. 5.19 NOTE THE STREAKS

FIG. 5.20 UNEVEN TONE

FIG. 5.21 UNEVEN CUT

VI – PRACTICE EXERCISES

Practice is most important when developing airbrush skills. It is extremely important to practice exercises which develop coordination between the finger tip and arm movements. As the music student practices scales to develop coordination, the airbrush student should practice exercises. The student may develop exercises of his own if he finds difficulty in performing certain techniques. This section lists exercises which will be helpful for the beginner.

The first experience with the airbrush may be just 'doodling'. The student may experiment by spraying various amounts of paint at various distances, etc. He may just concentrate on holding the airbrush correctly and have complete freedom.

Exercise 1

The objective of this exercise is to help develop the coordination between the fingertip and the movement of the arm.

The Problem

To airbrush an even tone over a rectangular area by spraying air in two directions, paint in one direction.

The Drawing

Draw two rectangles with dimensions given in Fig. 6.1. This may be drawn on a ditto and run off. Omit dimensions on the drawing. This drawing may be used for Exercises 3 and 4. If the exercise is repeated on illustration board, refer to dimensions of Fig. 6.2.

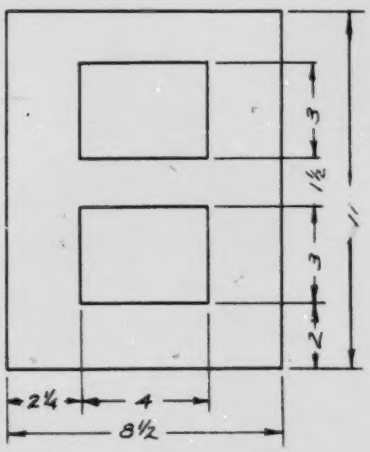


FIG. 6.1

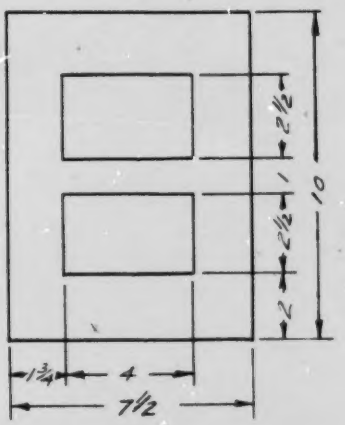


FIG. 6.2

The Procedure

Spray an even tone left to right. On the return, blow air without paint. Stop the flow of paint but **NOT** the flow of air. (Fig. 6.3). The air on the return stroke will help dry the paint and help coordinate the finger with the arm movement. The fingertip should return to the same position to spray an even amount of paint on each stroke. Repeat for the second rectangle. The instructor may cut out the rectangles as described on page 24.

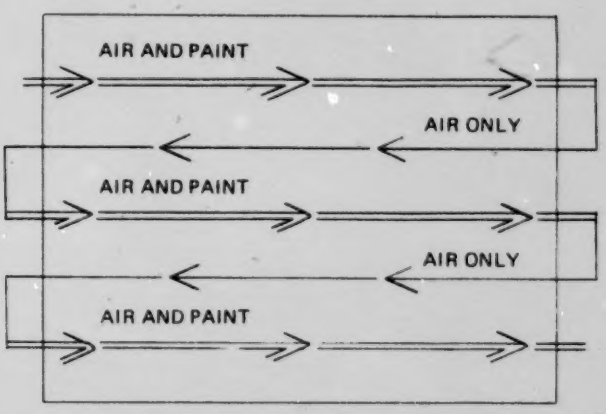


FIG. 6.3

Exercise 2

The object is to help develop the coordination of the movement of the arm. By developing this coordination the student should be able to control the color more effectively.

The Problem

Make an evenly graduated tone ranging from black to white without showing streaks.

The Drawing

Draw two rectangles with dimensions given in Fig. 6.1. This may be sprayed directly on a mimeographed sheet.

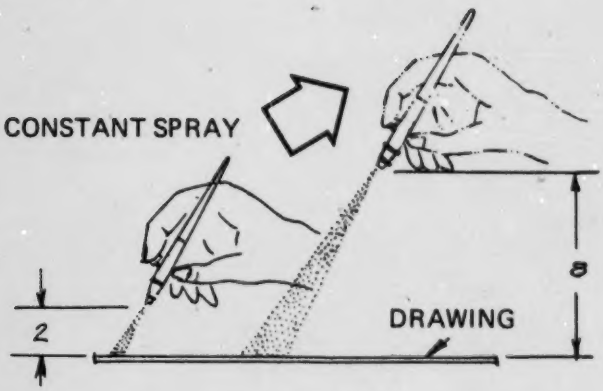


FIG. 6.4

Accomplish the exercise by increasing the distance from the tip of the airbrush to the paper after each stroke. Begin approximately 2" from the paper and while continuously spraying air and paint in both directions, increase the distance to approximately 8". Repeat for the second rectangle. Remember that you are only concerned with the area within the rectangle.

Exercise 3

This exercise is essentially the same as Exercise 2 except for procedure. In this exercise, make the evenly graduated tone from black to white by keeping a constant distance between the tip of the airbrush and the drawing. Begin by spraying very little paint at the top and gradually increasing the flow of the paint as the strokes are lowered. Spray paint and air in both directions. Repeat exactly the same for the lower rectangle. Once again, you are only concerned with the area inside the rectangle. Exercises 3 and 4 may be repeated several times on plain paper before airbrushing them on illustration board using frisket paper.

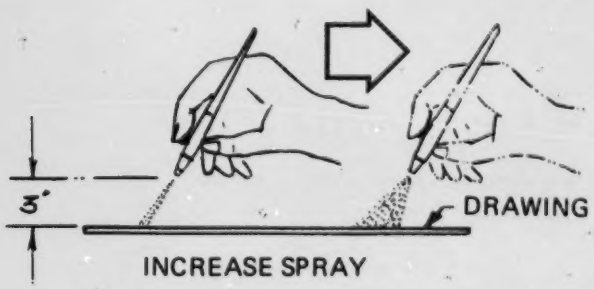


FIG. 6.5

Exercise 4

The Problem

To spray a small amount of paint in an open area.

The Drawing

Draw dots 1" apart as shown in Fig. 6.6

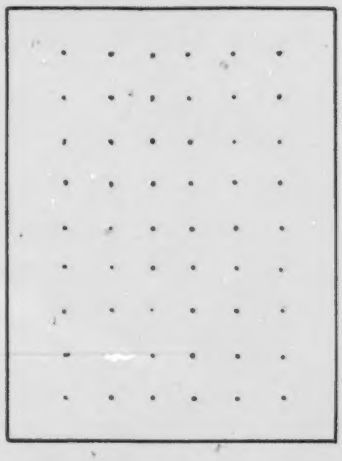


FIG. 6.6

The Procedure

FIG. 6.7

The instructor may mimeo exercise pages in advance. Draw dots on a mimeo master 1" apart as shown in Fig. 6.6. The exercise is to airbrush a circle around the dot in a single motion and move to the next dot and repeat, etc. The circle should begin and end in approximately the same place in order to show as perfect a *donut* shape as possible. This exercise is extremely difficult even for experienced airbrush artists.

VII – RENDERING BASIC SHAPES

The logical method of building competencies in airbrush work is by successfully rendering several basic shapes and gradually advancing to more complicated forms and objects. The sequence of problems shown in this chapter is generally in order of difficulty. The basic shapes to be rendered are the cylinder, pyramid, cube, cone, and sphere. Often complicated objects are merely a combination or variation of these basic shapes. Once these shapes are mastered, the advance work will become significantly easier.

Prior to rendering any of the basic shapes, the student should construct a graduated tone chart. This is a chart which ranges tones from pure white to black with a series of grays in between. After completing a successful chart, the student can use it as a reference for future projects correlated with this book. The illustrations for each project have a suggested approach indicating tones to be sprayed in specific areas.

Problem #1 – Graduated Tone Chart

The Problem

To construct a graduated tone chart of eight tones ranging from white (#1) to black (#8) with a series of grays in between. Each succeeding tone must contrast and be progressively darker as the numbers get higher. Each square must be a consistently even tone.

The Drawing

On a piece of white illustration board $3\frac{3}{8}$ X 15 inches, draw eight 1"X1" squares, leaving $\frac{1}{2}$" between them (Fig. 7-1).

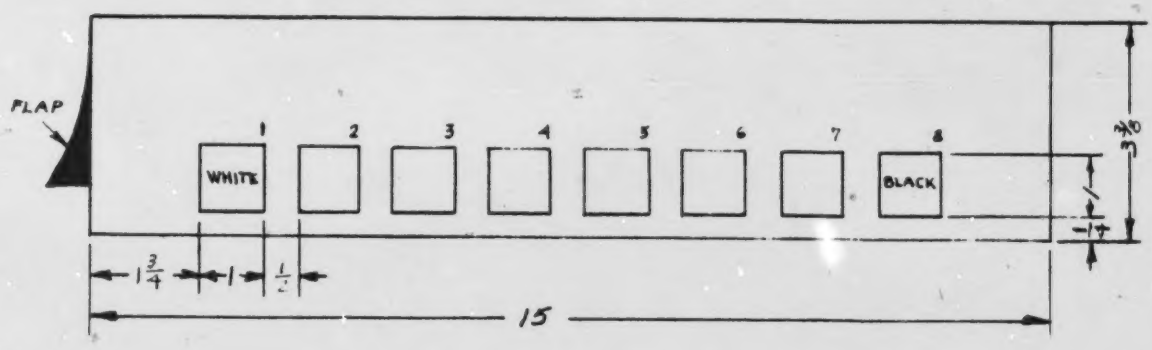


FIG. 7-1

Spraying the squares evenly is relatively easy. However, keeping the sequence of tones in order will be a bit difficult. The squares are drawn close to the edge of the board for ease in matching future renderings. One standard size for illustration board is 20" X 30". An economical method of cutting this with minimum waste is shown in Fig. 7.2. This is more appropriate for classrooms or groups rather than individuals working with the airbrush.

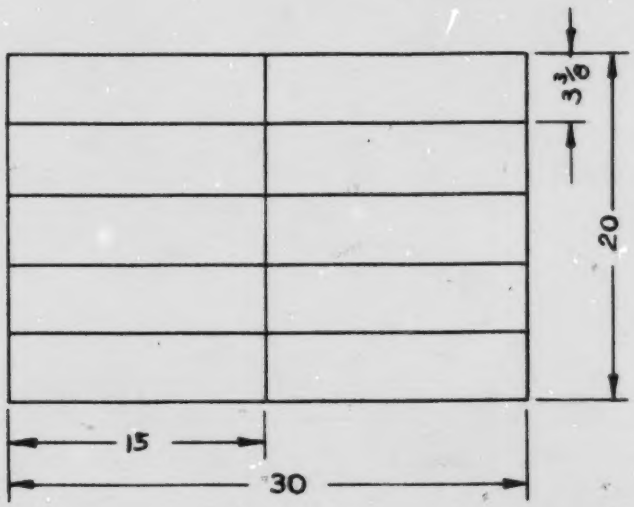


FIG. 7.2

The Procedure

Do not spray block #1. The white illustration board will represent the pure white. Spray black paint for each tone. The darker tones will result from more passes over an area. To achieve the total black on block #8, it may be necessary to pass over the area 50 or more times. Avoid spraying too much paint at one time. This is a common fault of the beginner.

Remove frisket from block #2 and spray an even tone using *very little paint*. It may look as though no paint was sprayed at all.

However, this may be checked by placing a piece of white paper next to the block in order to judge how much is being sprayed. After block #2 is complete, remove the frisket from block #3. Do not replace the frisket on tone #2; merely protect the sprayed area with a piece of paper. After tone #3 is sprayed, remove the paper protecting tone #2 and check to see if #3 is darker. When you are satisfied that it is, remove the frisket from tone #4 and spray while protecting the previously sprayed areas. Continue this procedure of spraying and checking until finished. Flap the chart and keep it available for future references.

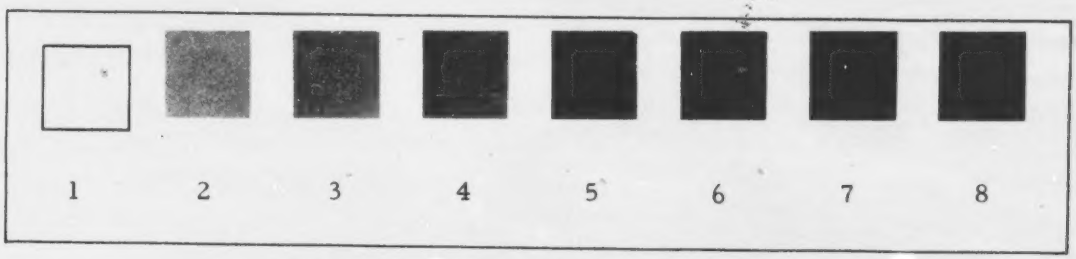


FIG. 7.3 FINISHED GRADUATED TONE CHART

Problem #2 – Rendering the Cylinder

The Problem

To render a cylinder giving a three dimensional effect with compatible tones. The cylinder should be represented as a smooth, brightly polished, solid piece of metal.

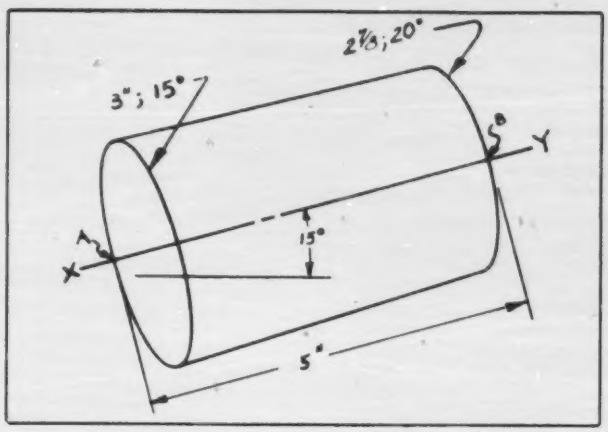


FIG. 7.4

The Drawing:

On a piece of 7½" X 10" illustration board, draw a cylinder referring to Fig. 7-4 for dimensions.

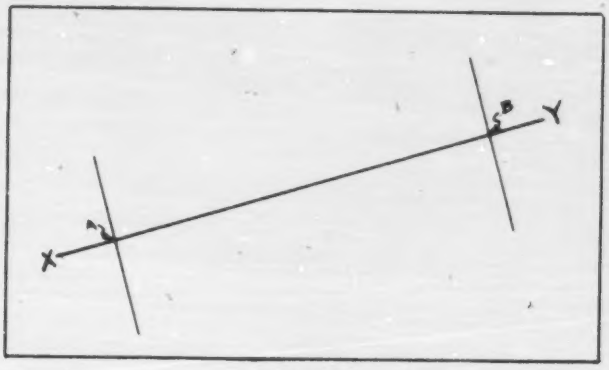


FIG. 7.5

A step-by-step procedure for drawing is as follows:

1. Draw line very lightly approximately 6" long on a 215° angle (This angle may be changed if desired.) Draw a light vertical line at points A and B (Fig. 7-5).

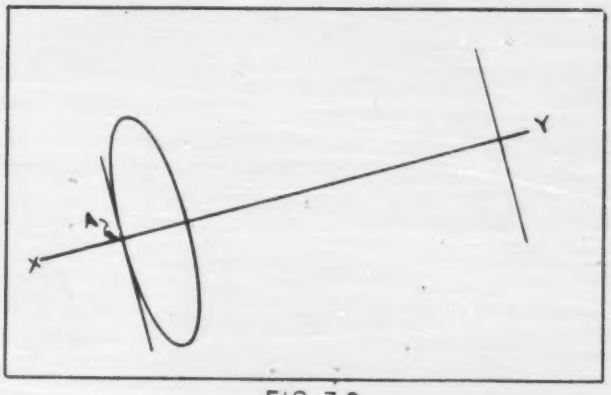


FIG. 7.6

2. Place the 15° 3" ellipse template on the drawing so that the minor axis falls directly on line XY at point A (Fig. 7-6).

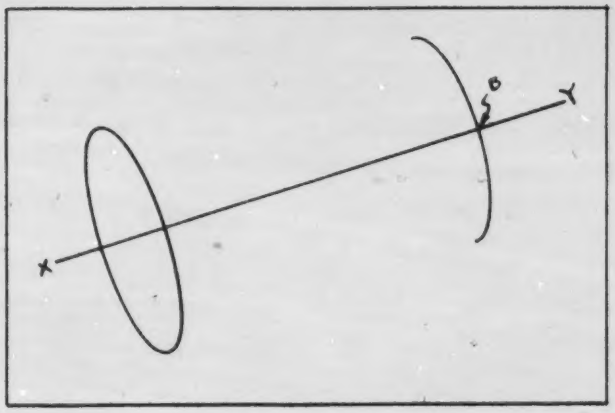


FIG. 7.7

3. Draw a crisp ellipse with a 2H or 4H pencil.

4. Place the 20° $2\frac{7}{8}$" ellipse template along line XY at point B and draw half of the $2\frac{7}{8}$" ellipse (Fig. 7-7).

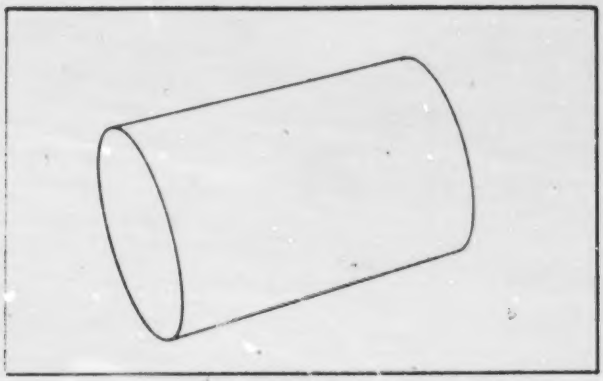


FIG. 7.8

Draw tangent lines from the front ellipse to the rear half ellipse to complete the cylinder (Fig. 7-8). Erase any construction lines including line XY with a kneaded eraser. The rear ellipse is slightly smaller than the front ellipse to give the illusion of perspective. The rear ellipse is a greater degree because the further it is from directly in front of the eye, the greater the circular end becomes visible as illustrated in Fig. 7-9 .

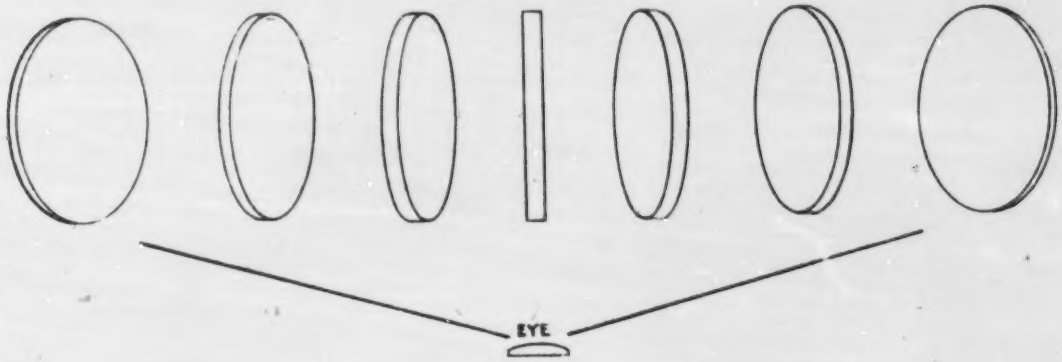


FIG. 7.9

The Rendering Procedure

1. Apply frisket paper to the drawing. Then proceed to cut both the elliptical end and the side before spraying. This is advisable because some lines may be covered by black paint, making it difficult to see the lines clearly in order to cut accurately.

2. On bright metal cylinders the reflections and highlights tend to run in a straight line parallel to the sides. Remove the frisket from the side and place it on the original backing sheet. It will be used again. Spray in the direction of the arrows in Fig. 7-10.

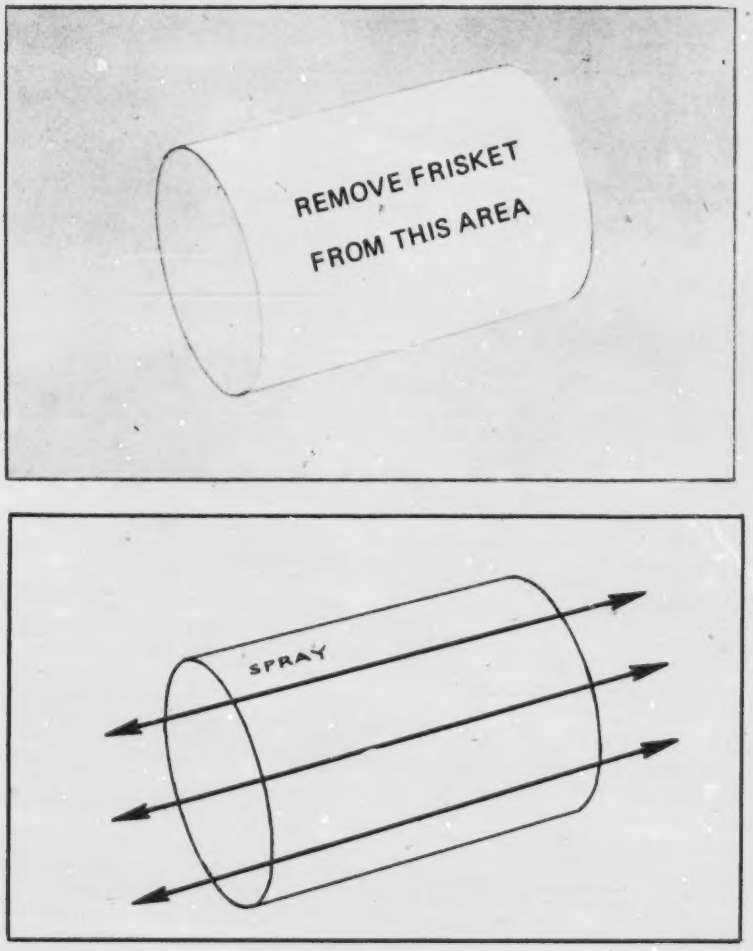


FIG. 7.10

3. Refer to Fig. 7-11 as a guide for spraying the tones on the cylinder. These tones are correlated to the tone chart. Spray the paint (very little at a time) in a straight line parallel to the sides. Note tone #1; this area is to be left absolutely white, which will add crispness to the rendering. If you tend to spray too heavily, some paint will settle on this area, leaving the rendering a bit dull or "flat."

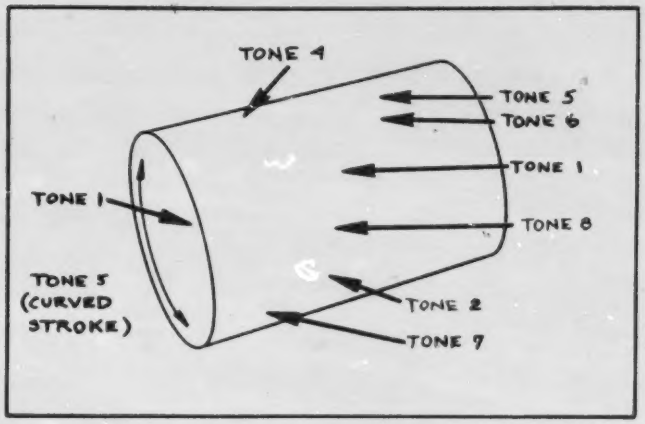


FIG. 7.11

4. Replace the piece of frisket over the entire finished side, or as illustrated in Fig. 7-12, place a piece of plain white paper over most of the finished side. Then place the frisket over the small portion of the rendering near the ellipse and onto the plain paper. Frisket will sometimes pick up some of the delicate spray when removed. The plain paper will protect most of the sprayed side.

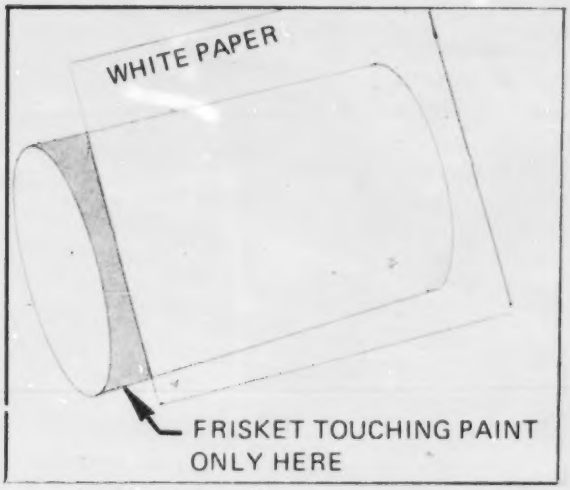


FIG. 7.12

5. Remove the frisket from the elliptical section of the cylinder and spray the end with a curve stroke (Fig. 7-11). Keep the stroke concentrated on the farthest side to retain an absolute white on the nearest side.

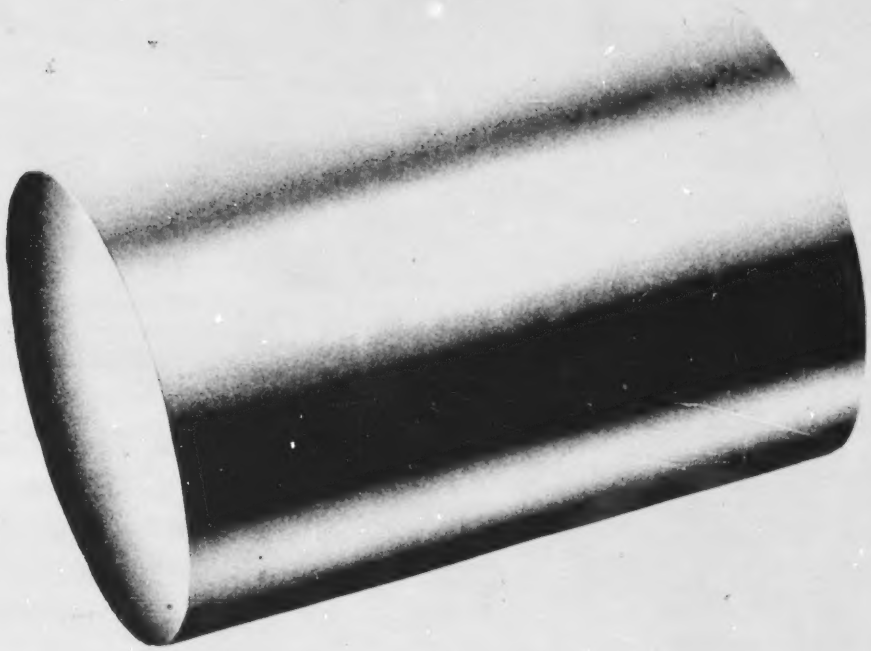


FIG. 7.13 FINISHED CYLINDER RENDERING

Problem #3 –Rendering the Pyramid

The Problem

To render two pyramids, each of which will represent a different type of finish.

1. The first pyramid will be a subtle finish representing a dull or matte finished metal, showing a good contrast between the lighted and shaded sides of the pyramid.

2. The second pyramid will represent a high-gloss metal finish.

The Drawing

Draw two pyramids on a piece of 7½" X 10" illustration board referring to Fig. 7-14 for dimensions. Omit all dimensions on the rendering.

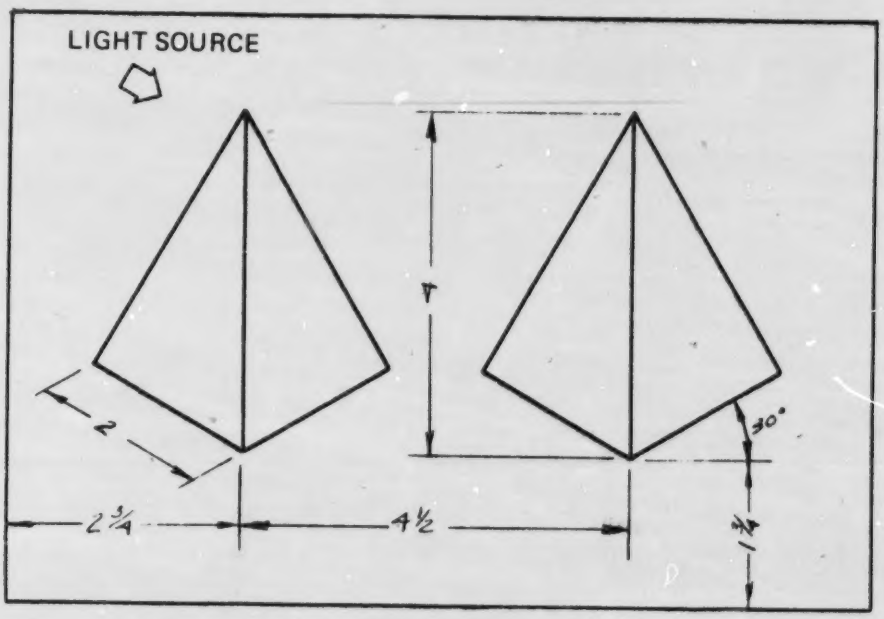


FIG. 7.14

The Procedure

1. We will assume that the light source is coming from the upper left side of the drawing. This means that the visible left plane of the pyramid will be the lightest side on each of the pyramids.

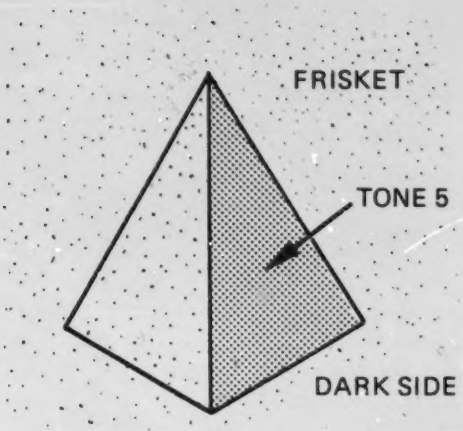


FIG. 7.15

2. Place the frisket over the drawing and cut all lines before spraying. Remove the frisket from the dark side of the first pyramid and spray an even tone #5 over the entire side (Fig. 7-15). (Try to match tone #5 on your graduated tone chart.)

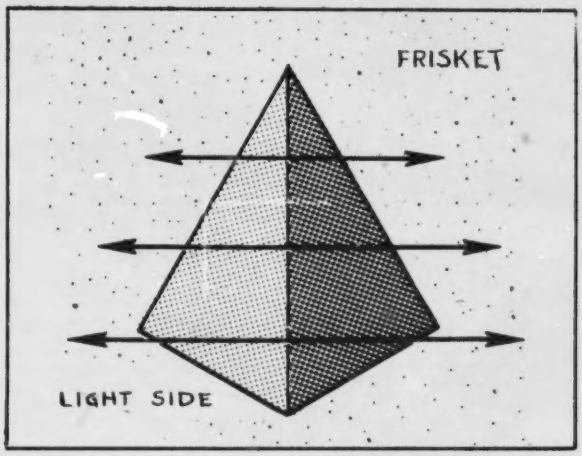


FIG. 7.16

3. Remove the frisket from the light side of the pyramid. In this case do not protect the side completed in step 2. Spray an even tone over both sides of the pyramid until the light side becomes tone #3. The shaded side will become progressively darker (Fig. 7-16).

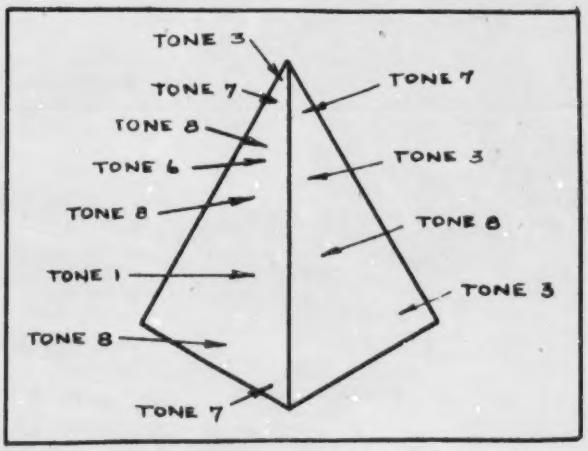


FIG. 7.17

4. Protect the finished pyramid with a sheet of paper and begin the second pyramid. Spray the shaded side first with tones indicated on Fig. 7-17.

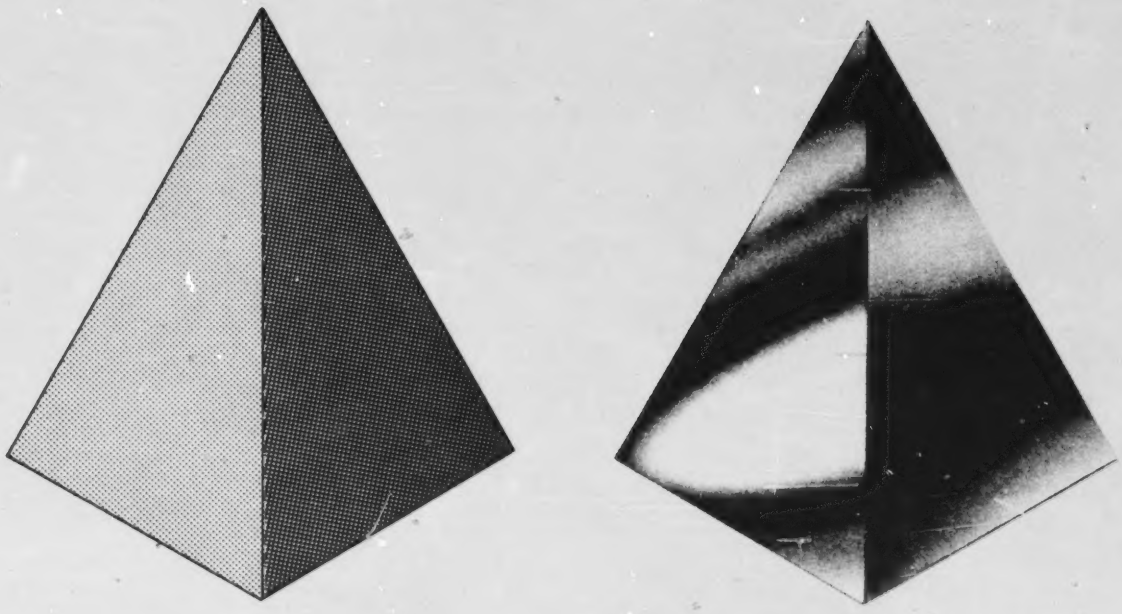


FIG. 7.18

FINISHED PYRAMIDS

Problem #4 Rendering the Cube

The Problem

To render a cube depicting the various sides with tones compatible to each other. Each of the visible sides and the top are to be rendered as a subtle metal finish.

The Drawing

Draw a 2½" cube in perspective on a piece of 7½"X10" illustration board omitting all dimensions. Refer to Fig. 7-19 for dimensions.

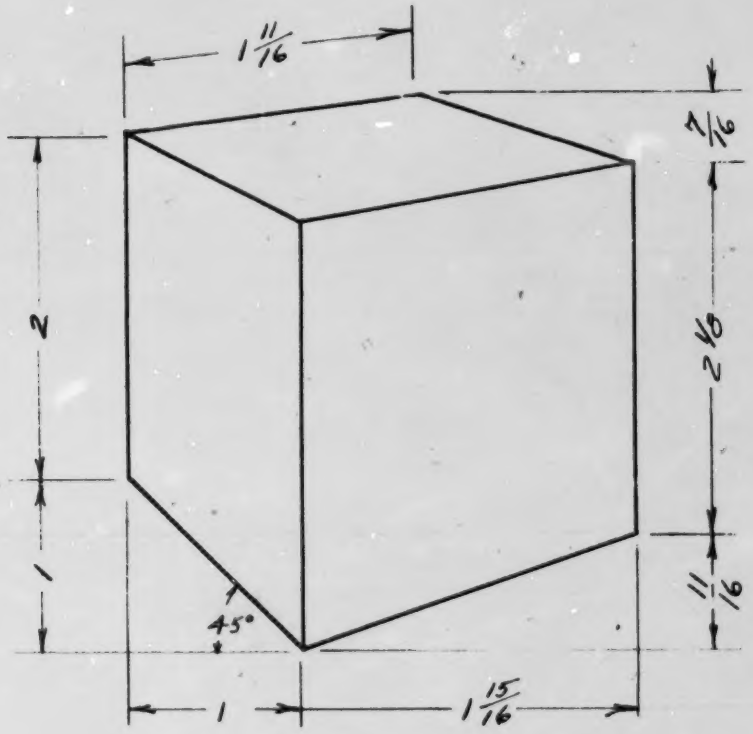


FIG. 7.19

If the student prefers, you may choose to construct a different cube by any of the various existing methods of perspective drawing. Following is a step-by-step method of constructing a cube in perspective (See Fig. 7-20.)

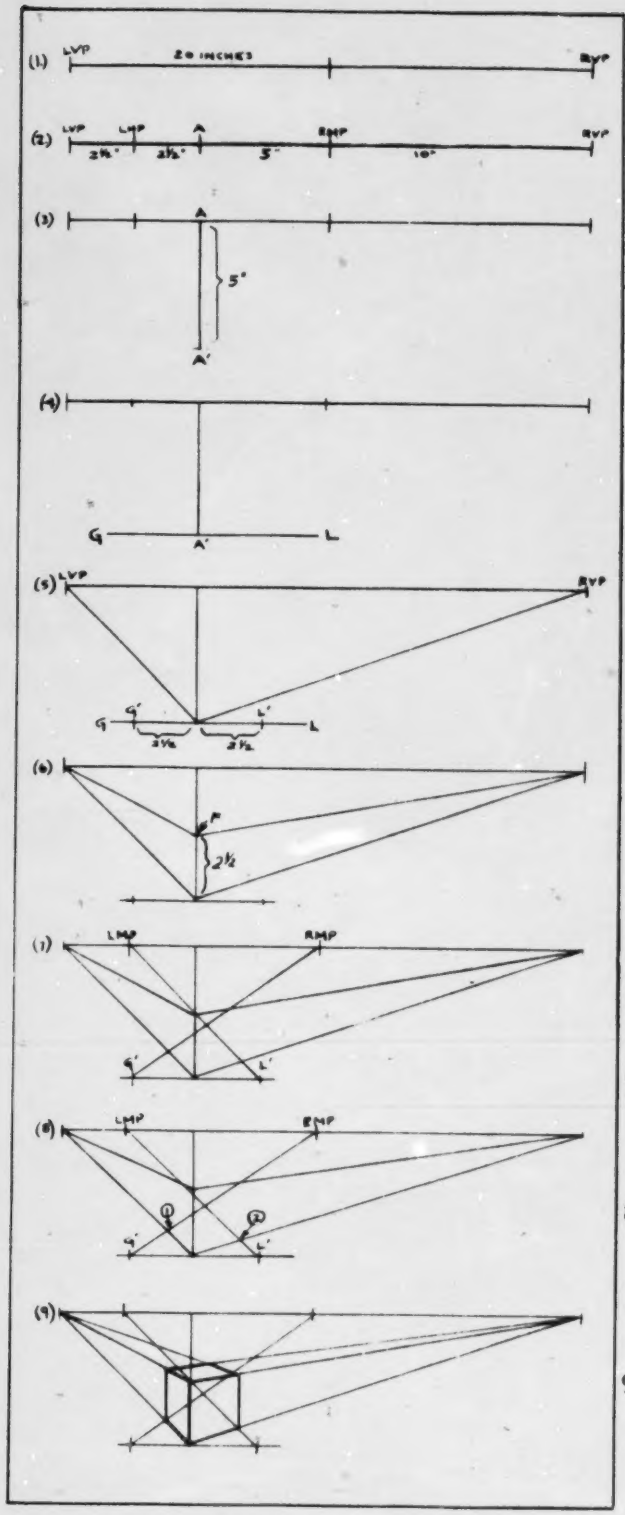


FIG. 7.20

1. Construct a horizontal line approximately 20" apart with a left vanishing point LVP and a right vanishing point RVP.

2. From LVP measure LMP, A, and RMP with dimensions shown in step 2, Fig. 7-19.

3. Drop a line from A about five inches to A'.

4. Draw a horizontal line GL through A'.

5. Connect A' to LVP and RVP. Then measure 2½" from A' toward G at point G' and 2½" from A' toward L at L'.

6. Measure up 2½" from A' to point F. Then connect F to LVP and RVP.

7. Connect G' to MPR and L' to MPL.

8. G' MPR crosses A' VPL at point 1 and L' MPL crosses A' VPR at point 2.

9. Erect verticals from points 1 to FVPR and point 2 to RVPL. From these intersections complete the cube.

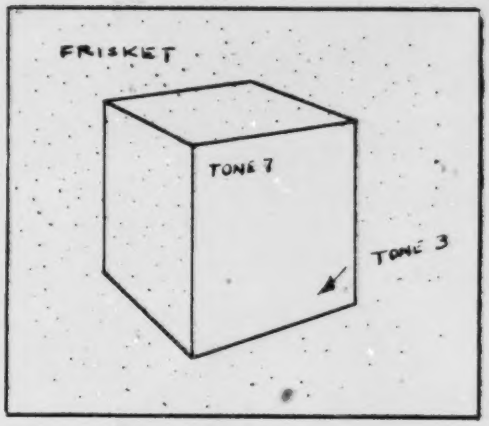


FIG. 7.21

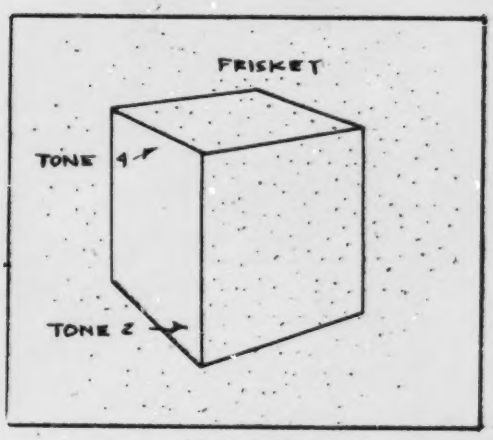


FIG. 7.22

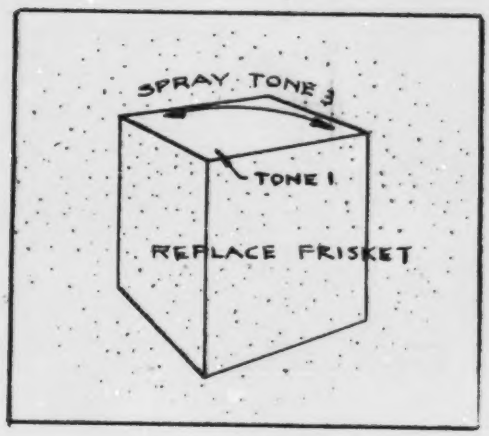


FIG. 7.23

The Procedure

1. Cover the drawing with frisket paper and cut all lines before spraying. Assume that the light source is coming from the upper left (Fig. 7-19).

2. Remove the frisket from the dark side of the cube and spray a tone graduating from #7, to #3 (Fig. 7-21).

3. Replace the original frisket paper on the dark side and remove the section of frisket covering the light side. Spray a tone graduating from #4 to #2 (Fig. 7-22).

4. Replace the original frisket on the light side and remove the section of frisket covering the top of the cube.

5. Spray an even tone #3 in an arc across the top. Be sure to leave the front corner white (Tone #1) (Fig. 7-23).

6. Lift all the sprayed planes and look for imperfections. Make any necessary corrections before removing the frisket from the background.

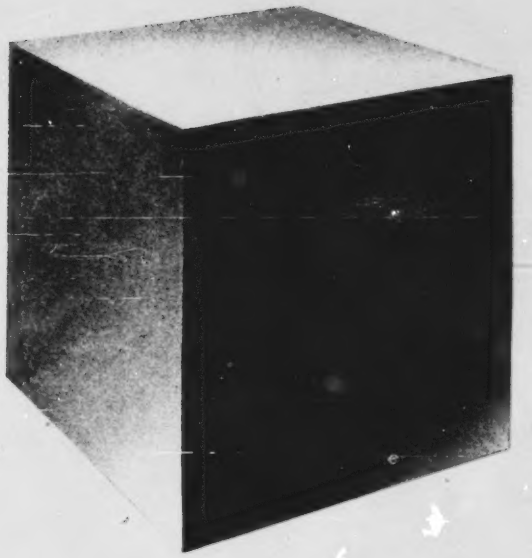


FIG. 7.24

FINISHED CUBE RENDERING

Problem #5 Rendering the Cone

The Problem

To render a cone giving the feeling of a curved plane of bright metal.

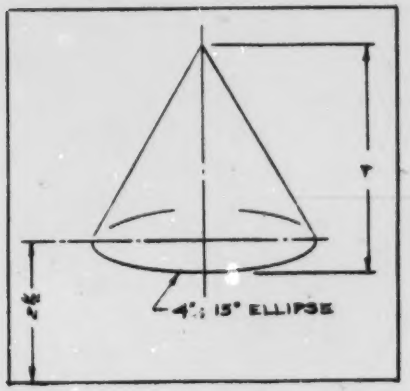


FIG. 7.25

FIG. 7.26

3. Measure up 4" from the front edge of the ellipse to establish the vertex of the cone (Fig. 7-27).

4. Connect the vertex tangent to the ellipse and darken the front half of the ellipse (Fig. 7-28).

Erase the construction line and the back half of the ellipse if drawn.

The Drawing

On a piece of 7½"X10" illustration board, draw a cylinder referring to Fig. 7-25 for dimensions. A step-by-step procedure for the drawing is as follows:

1. Draw a light, vertical construction line in the center of the board.

2. Approximately 2½" from the bottom of the board, draw a light 4" X 20° ellipse (Fig. 7-26).

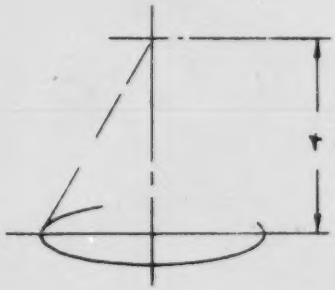


FIG. 7.27

FIG. 7.28

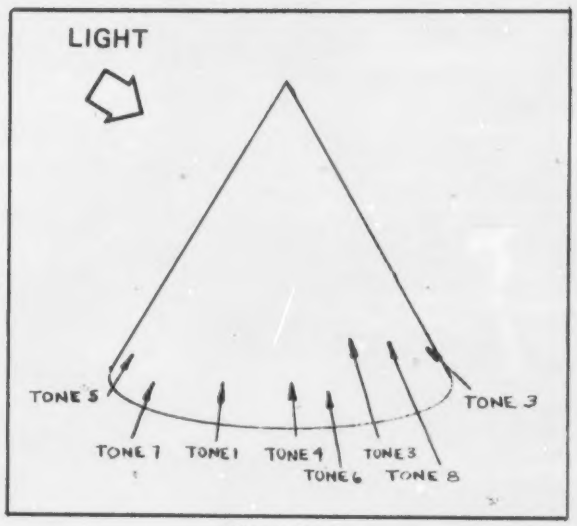


FIG. 7.29

1. Apply the frisket paper to cover the drawing. Cut a mask to protect the illustration board not covered by the frisket. Proceed to carefully cut out the entire shape.

2. Spray the cone, referring to Fig. 7-29 for the tones.

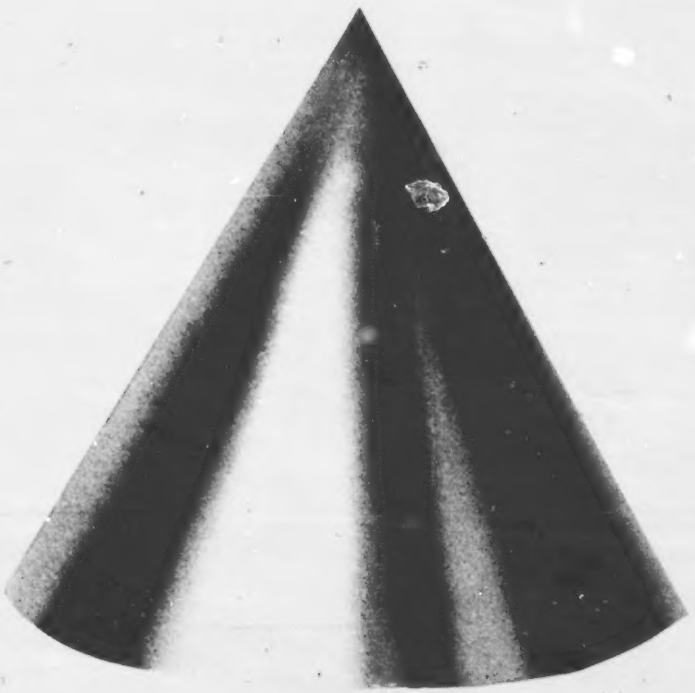


FIG. 7.30 FINISHED CONE RENDERING

Problem #6 – Rendering the Sphere

The Problem

To render a sphere giving the illusion of perfect roundness. This is the most difficult of all the basic shapes to render and may require several attempts before showing a definite measure of success.

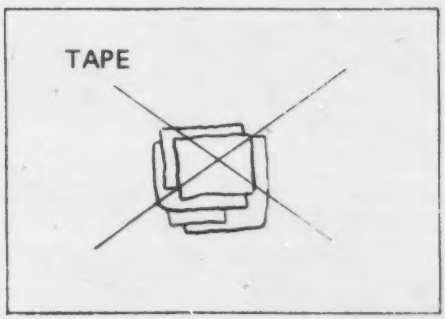


FIG. 7.31

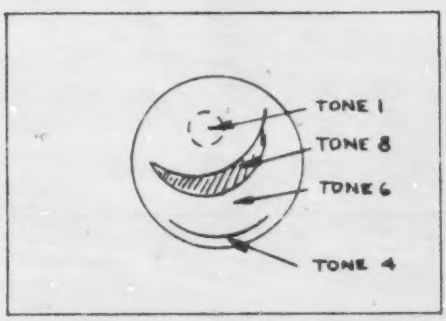


FIG. 7.32

The Drawing

In the center of a 7½" X 10" illustration board, draw a 4½" diameter circle. **BE CAREFUL** not to puncture the illustration board with the compass point. To prevent this, place four or five small pieces of drafting tape on top of each other at the center point (Fig. 7-31). Draw the circle; then remove the tape.

The Procedure

1. Cover the drawing with frisket paper; then cut the circle out freehand. Extreme care must be taken because the slightest error will become very obvious.

2. Refer to Fig. 7-32 for the suggested tone numbers.

3. Spray in a sweeping motion, moving the entire forearm continually. Follow the area marked with "X" in Fig. 7-32. Spray from left to right, decreasing the amount of paint when approaching the top. Be very careful to leave a white highlight near the top and a soft light area (tone #5) near the bottom. Try to avoid making any straight lines or sharp definition of tones, which might indicate a definite change in plane. Since a sphere is a perfectly curved shape, the tones should blend smoothly.

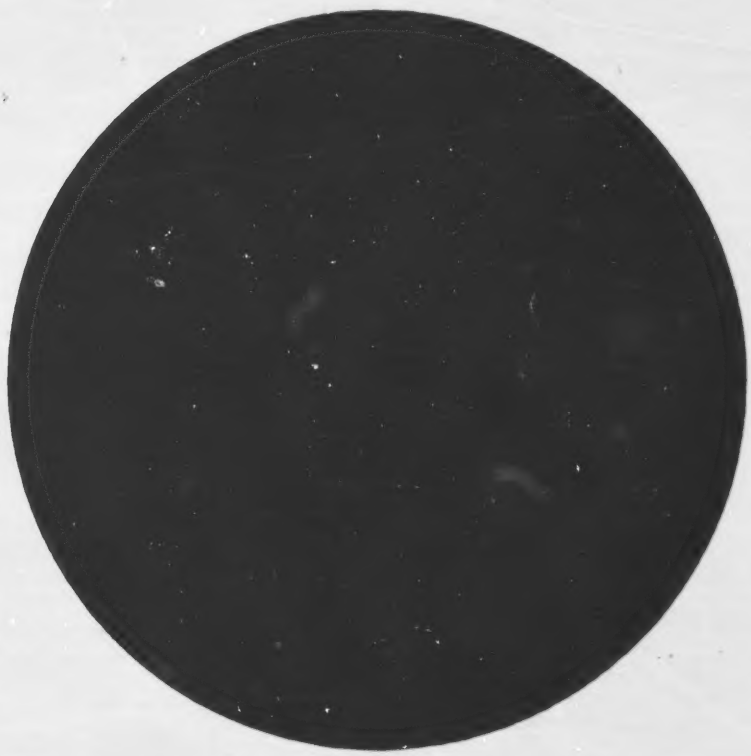


FIG. 7.33 FINISHED SPHERE RENDERING

After each of the basic shapes have been completed, the student is encouraged to render the same shapes creatively. He can change the tones to those of his own choosing and alter the drawings as he wishes. The rendering problems have an infinite amount of solutions. The airbrush is a tool which has limitless creative potential. A general rule that a student may keep in mind when rendering a polished or bright surface is to have a white area, a black area, and several tones of gray.

VIII – CLEANING AND MAINTENANCE

The airbrush is an extremely delicate instrument and must be thoroughly cleaned immediately after using. Most of the trouble is caused by improper or inadequate cleaning. In the industrial world, time is money. The consultant or corporation cannot afford unnecessary delays due to negligence in proper maintenance.

NEVER use hot water when cleaning the airbrush. Beeswax is used as a sealer for certain parts, and heat can break the seal. For ordinary cleaning it is not necessary to take the airbrush apart. The following recommended cleaning procedure will insure continuous, trouble free airbrushing.

Everyday Cleaning Procedure

1. Pour any remaining paint out of the cup. Fill it with clean, *cold* water and stir with a brush to dissolve any remaining paint; then pour it out.

2. Refill the cup with clean, cold water. Pointing the airbrush away from the table, hold the front lever down and all the way back. Spray a minimum of one cup of water through the airbrush.

3. Refill the cup with clear water. While holding the front lever down all the way back, place a finger of the left hand over the opening of the spray regulator so that air will bubble back up to the cup (Fig. 8-1). This is called *'backflushing'*. The water in the cup will become dirty as paint is flushed back into the cup. Empty this water and repeat backflushing until all traces of color are gone.

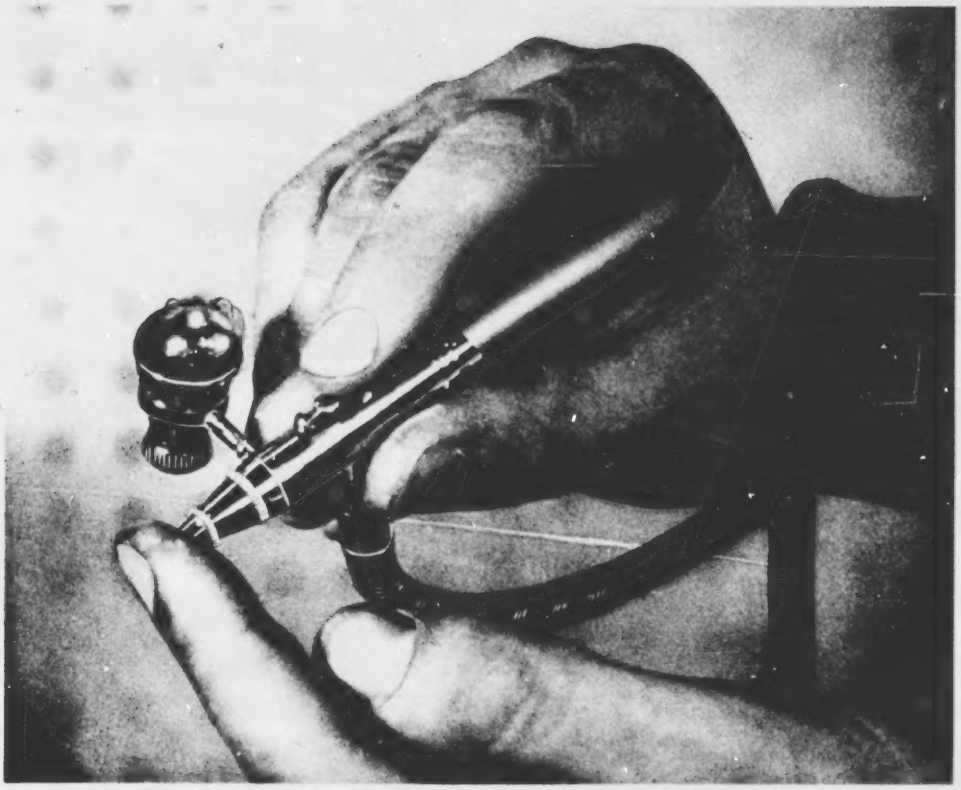


FIG. 8.1

4. Refill the cup with clean water, and spray until only clean water comes through.

5. After you are satisfied that the airbrush is clean, empty the cup and blow air through it for approximately 15 seconds to dry the inside working parts.

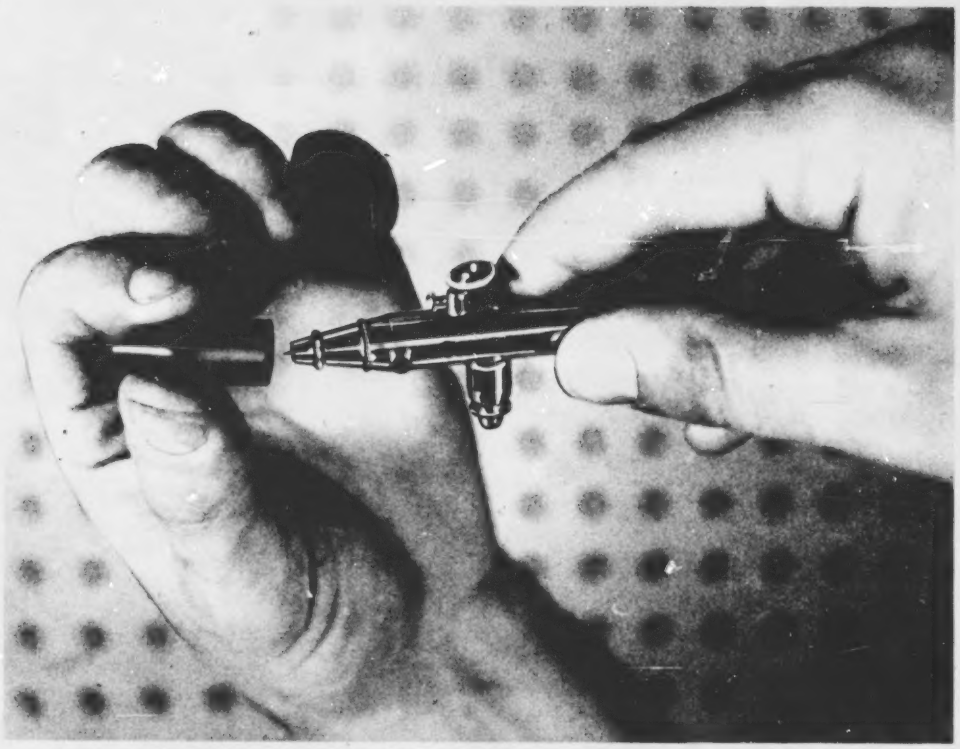


FIG. 8.2

6. Remove the needle (page 55) and wipe it off with a damp tissue.

7. Replace the needle and protection cap (Fig. 8-2).

Cleaning Before Storage

Several artists in the field recommend that a few drops of 'Joy' liquid detergent in a cup of water be blown through the airbrush before storage.

How to Clean the Spray Regulator

Remove the spray regulator by unscrewing it and clean with a sharpened match or wet paint brush.

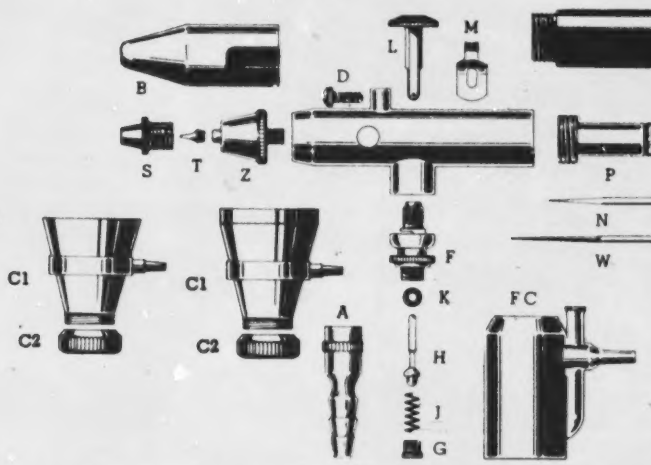
Maintenance

Repairs may be made by the individual or returned to the manufacturer for overhauling. It is recommended that all major repair work be done by the manufacturer or a reputable airbrush dealer.

If you choose to mail it to the manufacturer, be sure to pack it securely in order to avoid unnecessary damage through handling. The manufacturer will replace defective parts at a reasonable rate and return it in perfect working condition.

If you make your own repairs, use genuine parts of the same manufacturer as that of the airbrush. When ordering parts for your airbrush, be sure to give the serial number of your airbrush. When replacing parts, extreme care must be given to insure an exact fit.

THAYER & CHANDLER REPAIR PARTS



REPAIR PARTS

A. Connecting Nipple.
B. Protection Cap.
C. Color Cup, V-Shape.
FC. Color Cup, Flat.
D. Adjusting Screw.
E. Handle.
F. Valve Casing.
G. Valve Nut.
H. Valve Plunger.
J. Valve Spring.
K. Valve Washers.
L. Front Lever
M. Back Lever.
N. Needle.
O. Needle Tube
P. Tube Shank.
Q. Back Spring.
R. Spring Nut.
S. Spray Regulator.
T. Tip.
W. Reamer.
X. Needle Chuck.
Z. Head, New Style.

FIG. 8.3

How to Remove Needle

1. Remove the handle by unscrewing it.

2. Loosen the needle chuck (Fig. 8-3).

3. Remove the needle from the rear.

How to Replace the Needle

1. Be sure the adjusting screw (Fig. 8-3) is in a position to allow the front lever to go as far forward as possible. This may have to be turned to the left or counter-clockwise.

2. Insert the needle through the needle chuck until it is gently seated against the tip.

3. Tighten the needle chuck.

4. Turn the adjusting screw one turn to the right in order to keep the front lever from touching the post.

How to Remove Tip

1. Remove the spray regulator by unscrewing it (Fig. 8-3).

2. Remove the needle as described previously.

3. Fasten the end of the back reamer in the hand chuck (Fig. 8-4).

4. Push reamer in place of the needle until firmly seated. (The reamer will now be seated in the tip from the rear.)

FIG. 8.4

5. Turn the reamer clockwise and the tip will unscrew from the airbrush and be held by the point of the reamer (Fig. 8-5).

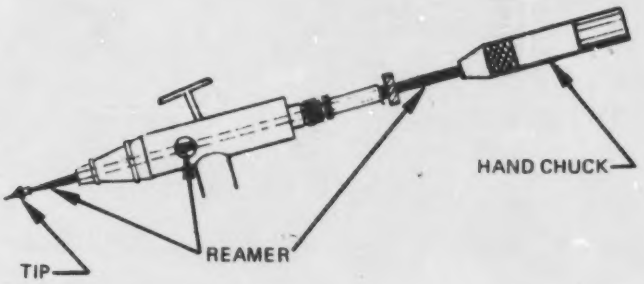


FIG. 8.5

How to Replace Tip

The tip is extremely delicate and should be replaced if damaged. Do not attempt to repair a damaged tip. To replace tip:

1. Start tip on threads of the head by hand.

2. Wax threads with beeswax.

3. Replace the reamer in the airbrush, inserting it firmly into the tip from the rear.

4. Turn reamer and tip to the left until tight.

5. Replace needle and spray regulator.

6. Melt wax by heating the end of the airbrush with a match. Then hold the airbrush vertically with the tip up until cool. This will seal the threads.

How to Replace Head

1. Remove head by turning counter-clockwise. (Use a cloth or some other material in jaws of pliers to prevent marring).

2. Wax threads before replacing head.

3. Screw head on tight.

4. Heat head with a match to melt wax. Hold the airbrush vertically with the tip up until cool. This will seal the threads.

How to Clean Color Cup

The normal cleaning procedure is usually enough to keep the cup clean. At times the cup may become clogged. In order to remove this dried paint:

1. Remove the screw in Fig. 8-6 and run a thin wire through.

FIG. 8.6

2. Wash with clean water and dry with air.

3. Replace screw(s).

How to Replace Valve Washer

1. Remove the valve nut (Fig. 8-3). The spring and plunger will then drop out.

2. Remove the valve washer. Be careful not to damage the delicate threads inside.

3. Insert a new valve washer. Force it into place with a match.

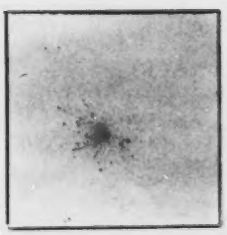
4. Replace plunger, spring, and valve nut.

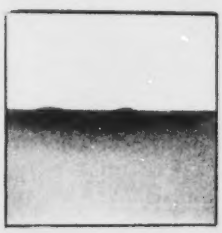
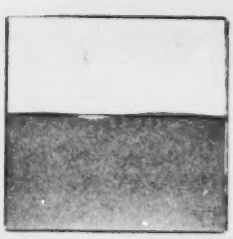
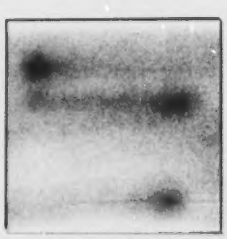
IX – ERRORS

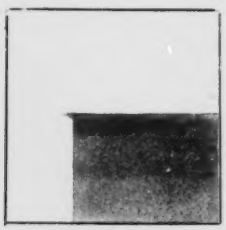
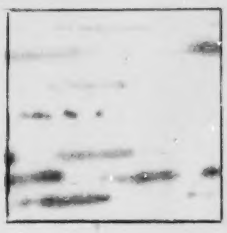
The beginner should try to analyze examples of common errors. If one can assess why something happened, he will be more apt to prevent a similar occurence on a future problem. In most cases errors are careless and could be prevented with little effort. The old cliche of "an ounce of prevention is worth a pound of cure" is most appropriate in airbrush work. Errors involving technique should improve with experience. Theoretically, any error should be able to be corrected, since one primary function of the airbrush is to alter photographs and drawings. An error may be considered a new problem to be solved.

It is suggested that a 'morgue' or file, including unsuccessful as well as successful attempts at projects, be kept for future aids or references. Notations may be made on the projects indicating errors or circumstances that caused the particular error to happen. Often one learns through the experience of another person. A critique or discussion is a most valuable experience. A group of people or an entire class may set up the results of their rendering attempts and discuss each one. Positive aspects as well as errors should be pointed out and discussed. In addition to the skills one experiences by directly using the airbrush, first hand experiences are gained by observation and discussion with others.

Following are several errors, their causes and recommendations for prevention and/or correction.

ERROR	CAUSE(S)	RECOMMENDATION
A. Spatter of paint 	Bent Needle	Straighten or replace needle.
	Not enough air pressure	Increase pressure, depress front lever completely, check gauge (while spraying).
	Paint too thick	Add water to the paint, spray a few drops of water through the airbrush, then spray newly thinned paint.
	Spray regulator adjusted too far down	Adjust spray regulator (See "S" Fig. 8.3)
	Broken tip	Replace tip.

ERROR	CAUSE(S)	RECOMMENDATION
B. Feathering	Spraying too close to object with excessive air	Increase working distance.
C. Blurred edge or fuzzy line 	Frisket not down properly	Make sure frisket is down firmly before spraying. Use back of fingernail or burnishing tool to make sure edges are flat. Care must be taken not to make a depression in the paper. May be scraped with a double edge razor blade.
D. Uneven lines 	Poor cutting of frisket paper	Recut frisket and work over with spray. May be able to use ruling pen to straighten line. If extremely slight, a 4H pencil may be used to correct the error. Suggest using sharp dots rather than lines.
E. Blobs/Dumbbells 	Starting or coming to a stop while spraying on the object	Keep arm in motion and extend the stroke past the edge of the frisket or masked area.

ERROR	CAUSE(S)	RECOMMENDATION
F. Smears and dirt	Erasures, grit, or oily fingerprints on paper	Working surface must be thoroughly clean before spraying. Bestine rubber cement thinner may be wiped over an airbrushed area without smearing. This will remove oils.
G. Spraying an unwanted area 	Incomplete cutting of frisket. The corner tears when lifted	Extend the cut to overlap the lines slightly.
H. Broken spray 	Paint before air	Press operating button down before pulling back.
	Airbrush too close to paper	Increase working distance.
	Excessive air, may dry paint in airbrush	Spray a fairly heavy amount on a scrap piece of paper.
	Unwaxed tip or head	Wax tip or head (Chapter 8).

X – RENDERING PROBLEMS

Many sources for rendering problems are available to the airbrush student. One unlimited source exists in the multitude of illustrations used for drawing problems in various textbooks. These are readily available in public schools and libraries.

Select a typical drawing such as the one illustrated in Fig. 10-1. This type of illustration is usually an isometric drawing.

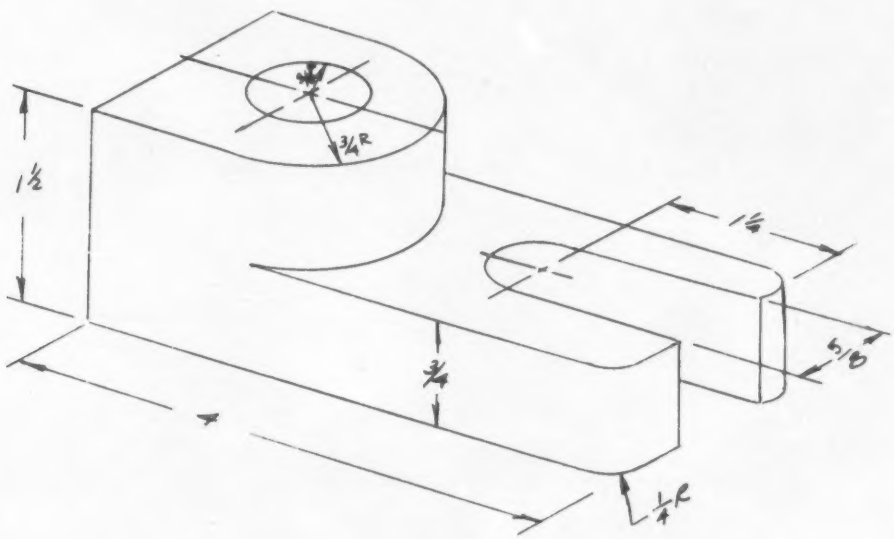


FIG. 10.1

Procedure

1. On a piece of tracing paper, mechanically construct the drawing as shown in the textbook. Omit all measurements, hidden, broken and center lines. Measurements may be taken directly from the illustration or they may be scaled to a comfortable working size. The student may prefer to use a pair of dividers to measure the drawing directly from the textbook. If this method is used, caution to prevent the book from becoming damaged by the divider's points must be used.

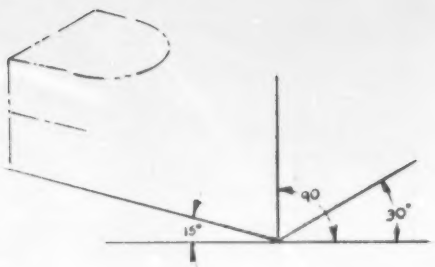


FIG. 10.2

The 'stock brace' may be drawn by first constructing a 15°, 30°, and 90° axis (Fig. 10-2). Measure along the axis to the desired scale of the final rendering.

2. If facilities, such as an ozalid machine, are available to reproduce the tracing, make two blue-line or black-line copies of the tracing. The most ideal print is a black line with a white background. If facilities are not available, white drawing paper may be used in lieu of tracing paper and reproduced by a dry print method. Most libraries and some department stores have a duplication facility which can be used inexpensively and most effectively. If reproduction facilities of any kind are not available, begin by making a free-hand line-drawing sketch of the object as clean and accurately as possible. (Fig. 10.3)

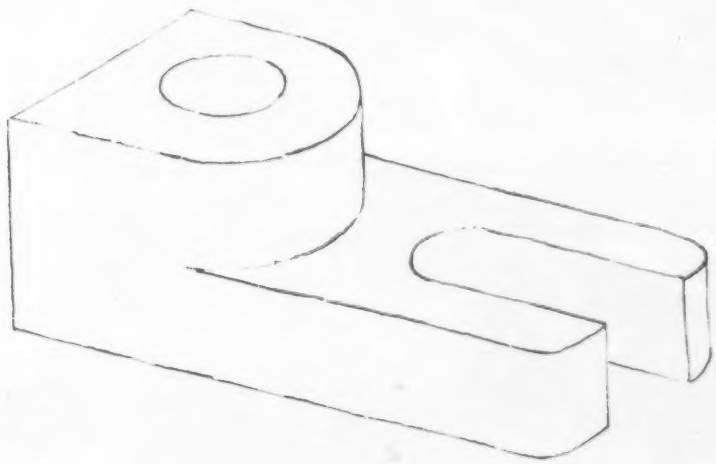


FIG. 10.3

3. Shading

Select a direction of a light source and begin shading with a soft pencil. Work on large areas first and the details last. Begin shading lightly with the pencil, keeping the lines light and going in the same direction.

Finished or machine surfaces will have a brighter finish than a sand casting surface. An eraser may be used to indicate highlights. Keep the tones gradual and varied. A general rule of thumb for crispness in a rendering, as in a photograph, is to have a white area, a black area, and various grays in between.

The 'stock brace', as many other forms, may be looked at as a series of simple, basic forms and handled as those basic renderings described in Chapter 7. Much of the entire shape of the stock base may be handled as the cube as shown in Fig. 10.4.

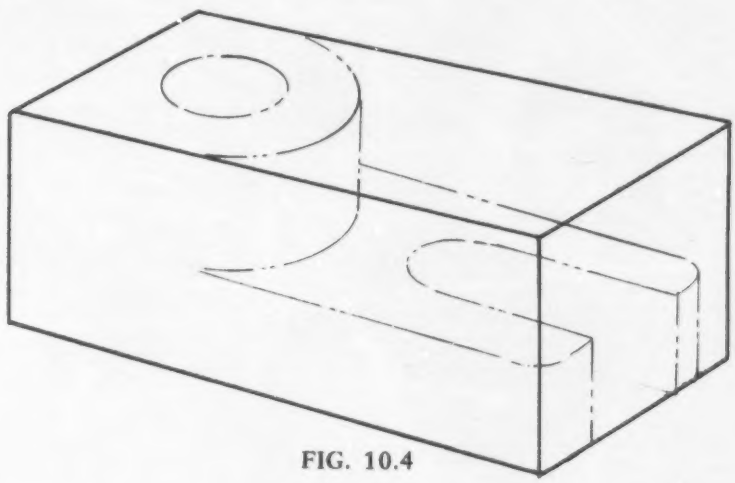


FIG. 10.4

The basic shape of the cylinder appears several times as shown in Fig. 10.5.

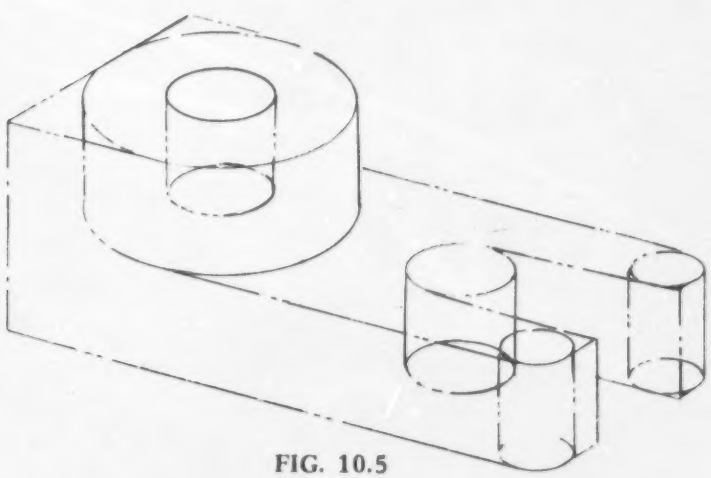


FIG. 10.5

When the sketch is completely shaded, it will serve as a guide for the finished rendering (Fig. 10.6).

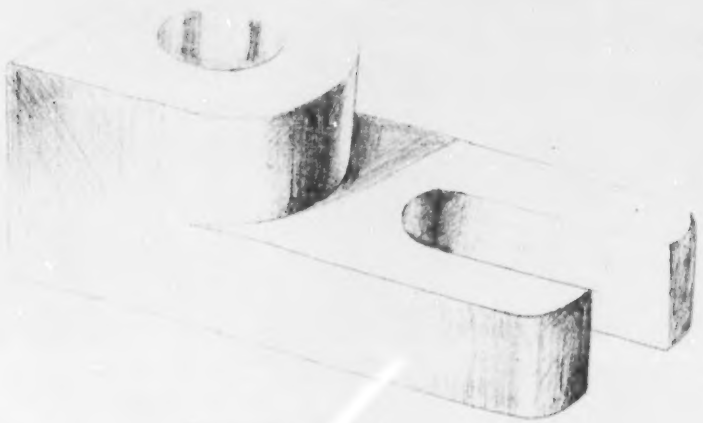


FIG. 10.6

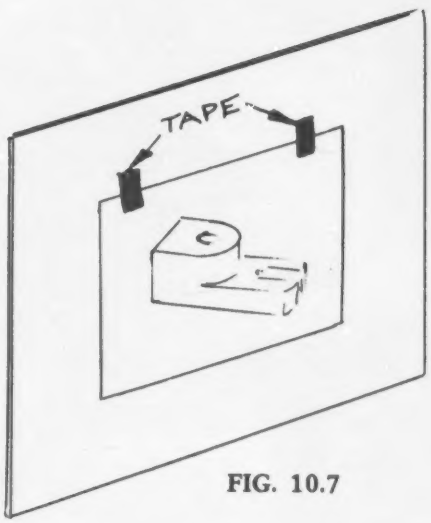


FIG. 10.7

4. Transfer the drawing from the reproduced print to the illustration board. If no reproduction facilities are available, use the original mechanical drawing. Rub graphite on the back of the print and trace with a sharp 4H pencil. This is less time consuming and cleaner than attempting an entire new mechanical drawing on the illustration board. When tracing, tape the print to the illustration board as shown in Fig. 10-7. The top two pieces of tape will act as a hinge to allow the student to check the drawing for the completeness. If a line is missed, the tracing may be dropped back into perfect register allowing the missing line or lines to be traced.

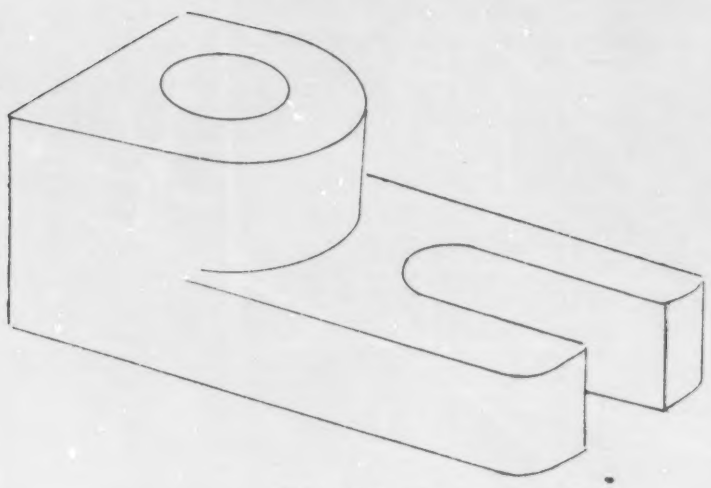


FIG. 10.8

The tracing on the illustration board must be extremely sharp and clean. If an excess of graphite is rubbed on the back of the print, 'fuzzy' lines may appear on the illustration (Fig. 10-8). If this is the case, take a kneaded eraser and gently erase the excess graphite from the line (Fig. 10-9). The line will still be visible enough to go over with a sharp 2H or 4H pencil (Fig. 10-10), leaving a clean, sharp drawing. The work is now ready to be airbrushed.

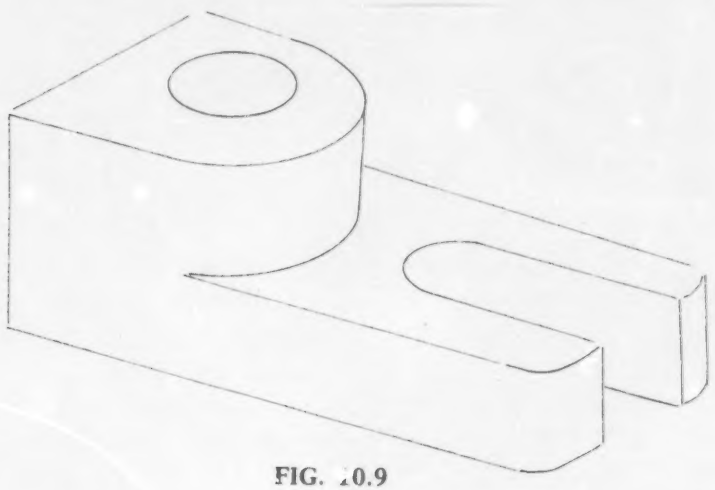


FIG. 10.9

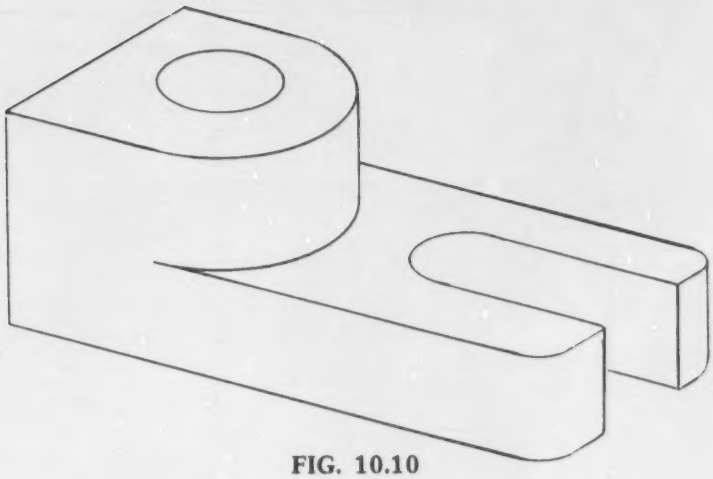


FIG. 10.10

As in sketching, it is generally advisable to airbrush the large areas first, leaving the details last. Use the shaded sketch (Fig. 10-6) previously prepared as a guide. An additional step may be taken to compare the tones of the graduated tone scale (Chapter 7) to the sketch. Numbers representing the tones may be marked directly on the sketch for a quick reference (Fig. 10-11).

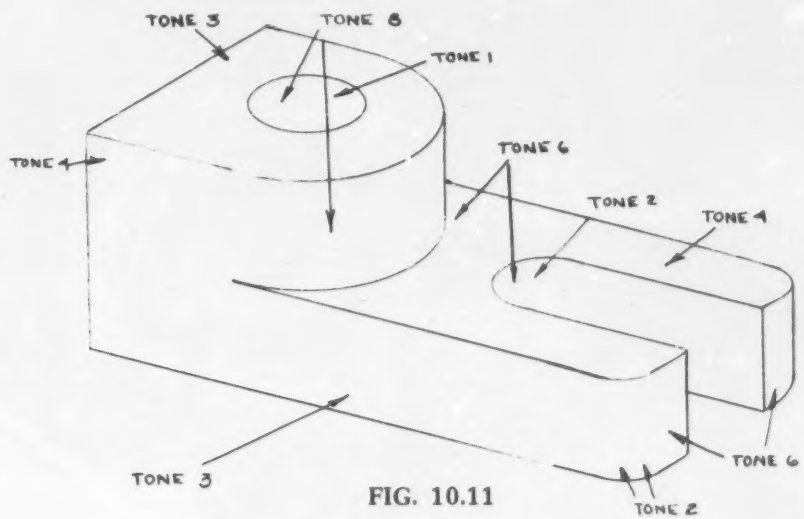


FIG. 10.11

If a dark area is desired with a lighter area to one or more sides, it is generally advisable to spray the darker area first. (Fig. 10-12). Enough excess paint may very well fall to the lighter area while the darker area is being sprayed. Should the lighter area be

The Vibration Eliminator

The Problem

Render a vibration eliminator illustrating the following:

1. The basic material used for the product is hard, black rubber.

2. A cut-a-way section showing an internal fabric used to reinforce the rubber.

3. Aluminum flanges used to support the rubber flanges at each end of the tube. Each flange has eight bolt holes equally spaced.

4. A trademark to appear somewhere on the product.

Procedure

Follow a procedure similar to constructing the stock brace, previously mentioned. Begin constructing the vibration eliminator on a piece of tracing paper referring to Fig. 10-14 for dimensions.

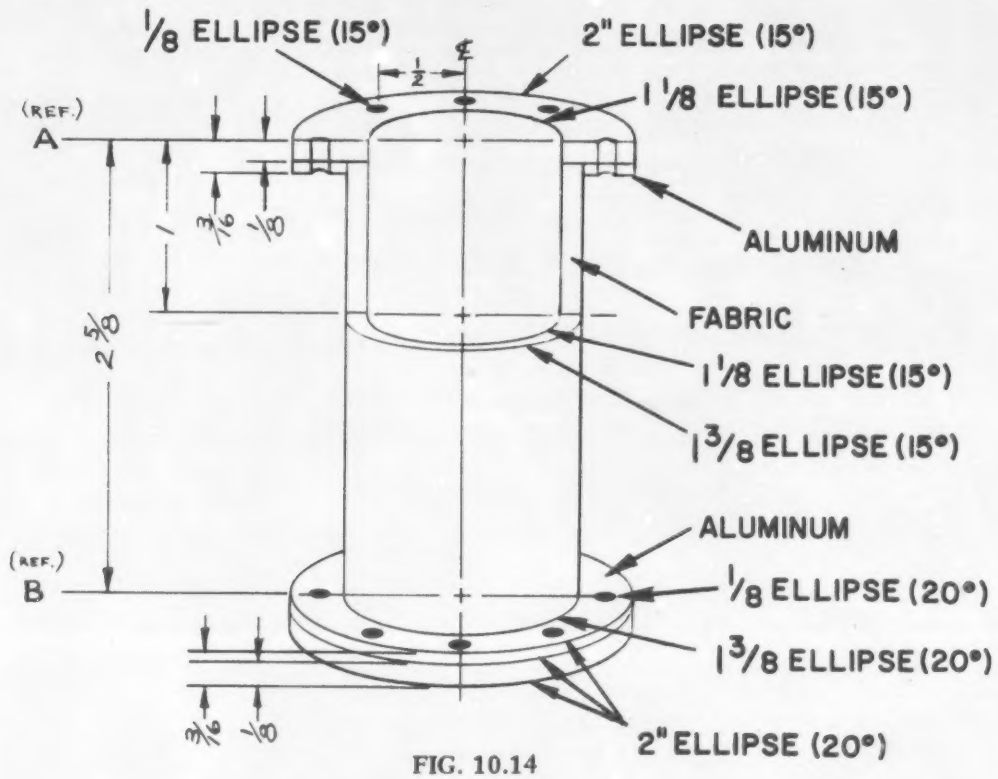


FIG. 10.14

FIG. 10.12

sprayed to the desired tone first, care must be taken not to further darken these lighter areas when spraying the darker area. Often the beginner has difficulty in leaving white areas on the rendering. This lack of a white area can make a rendering look 'flat' and may require the spraying of white paint to gain back the lost highlights.

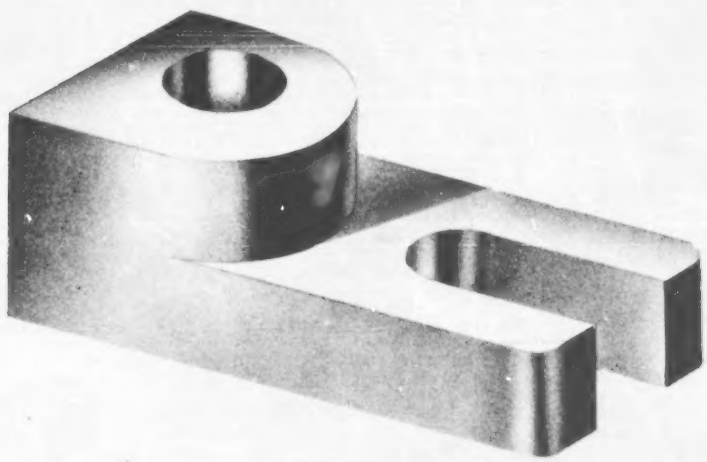


FIG. 10.13

A solution to the problem is shown in Fig. 10-13. It should be understood that infinite variations may take place. The finish on the material may be changed, the light source may be chosen from a different angle or the reflections may be handled differently. The creativity of the individual may come into play making various kinds of successful solutions. Indeed, most airbrush artists would execute unique, yet completely acceptable, solutions to the problem.

Following is a suggested way of drawing the isolator:

1. Draw a *light* vertical center line in the center of a 7½" × 10" illustration board.

2. Draw light reference lines A and B as dimensioned.

3. Draw the top half of a 2", 15° ellipse. Place the major axis on reference line A and the minor axis on the light, vertical center line. Draw a $1\frac{1}{8}$", 15° ellipse exactly the same way.

4. Drop two vertical lines from the ends of the $1\frac{1}{8}$" ellipse representing the inside diameter of the product.

5. Draw the rubber and aluminum flanges.

6. Measure down 1" from reference line A. This will be the major axis of the cut-a-way ellipse. Draw a $1\frac{3}{8}$" ellipse representing the inside diameter.

7. Draw the bottom half of a $1\frac{3}{8}$", 20° ellipse using reference line B as the major axis. From the extreme end of the $1\frac{3}{8}$" ellipse, draw vertical lines to the underside of the top rubber flange.

8. Draw a 2", 20° ellipse using reference line B as the major axis and the center line as the minor axis. This represents the bottom aluminum flange.

9. Draw the two remaining 20° ellipses representing the bottom of the aluminum flange and the bottom of the rubber flange.

10. Erase any unnecessary construction lines with a kneaded eraser.

11. Make sure all lines are crisp and clean.

When the drawing is completed, make a print from the tracing to begin shading. A pencil sketch showing suggested tones is illustrated in Fig. 10-15.

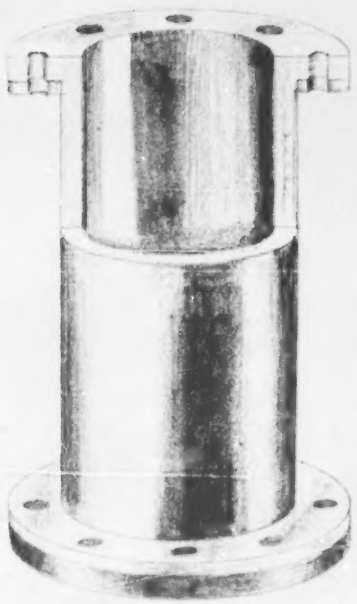


FIG. 10.15

The following suggestions may be helpful when rendering:

1. The rubber fabric is much easier to accomplish by painting by hand with a small brush. Paint the background tone 6. With a 00 brush, paint short, white lines representing the fabric.

2. The highlights on the inside of the cut-a-way view should stop before reaching the bottom part of the cut. This will give added dimension to the full round part of the tube.

3. After spraying the top rubber flange, go over the bolt holes with a fine tip, black ballpoint pen and an ellipse template. Draw $\frac{1}{8}''$, 15° ellipses for the top flange and $\frac{1}{8}''$,20° for the bolt holes in the bottom flange. With a 00 brush, color the bolt holes full intense black. Be sure to wipe the tip with a soft tissue after *every* line. The ink can build up at the tip and make a blot on the rendering.

4. Hand paint the top aluminum flange tones 5 and 1. Refer to finished rendering Fig. 10-16.

5. The aluminum flanges may be given a 'crisp' look by using the black pen with discretion. Care must be taken not to use the black pen excessively.

FIG. 10.16

Construct the drawing referring to the dimensions given in Fig. 10-17. When completed, make a print from the tracing paper to begin shading with a pencil directly on the print. A pencil sketch showing suggested tones is illustrated in Fig. 10-18.

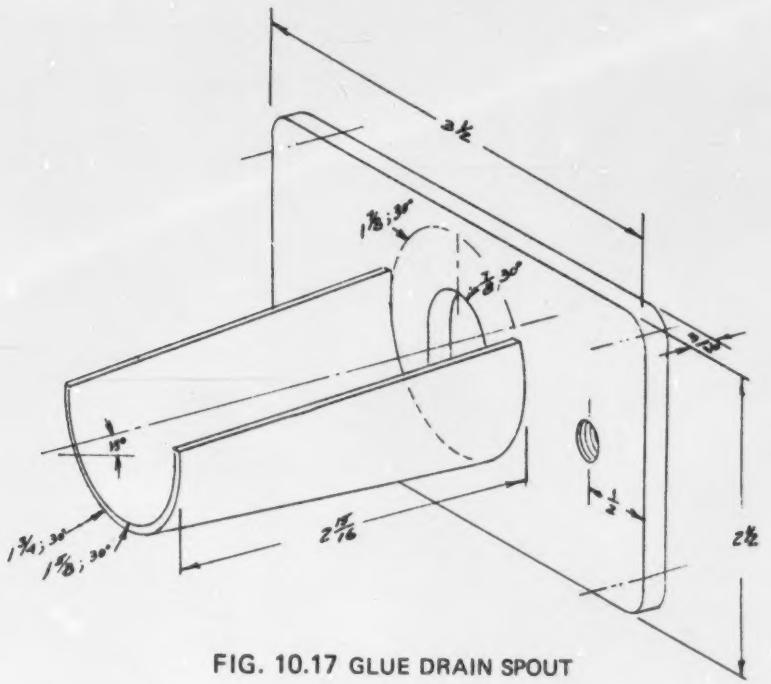
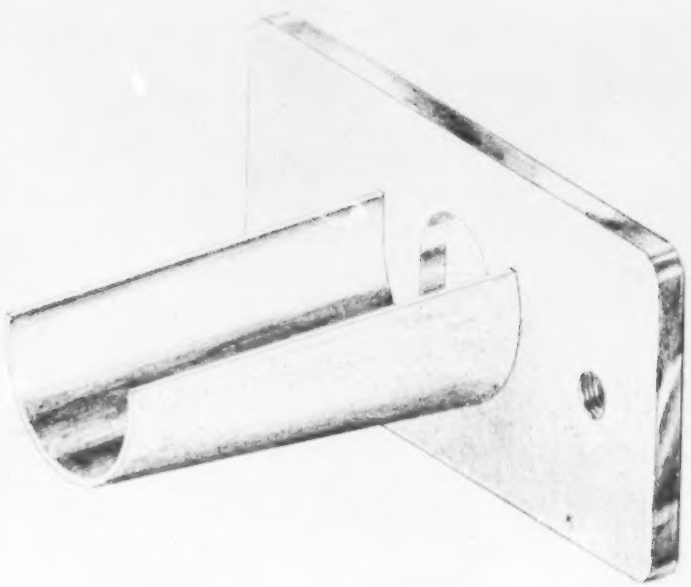


FIG. 10.17 GLUE DRAIN SPOUT



When airbrushing, the rough texture is achieved by spraying a relatively flat tone over the desired area. Adjust the spray regulator by turning it all the way closed and back off slightly until the spray is the desired heavy texture. (Fig. 10-19). The heavy texture is to be sprayed directly over the flat surfaces.

FIG. 10.19

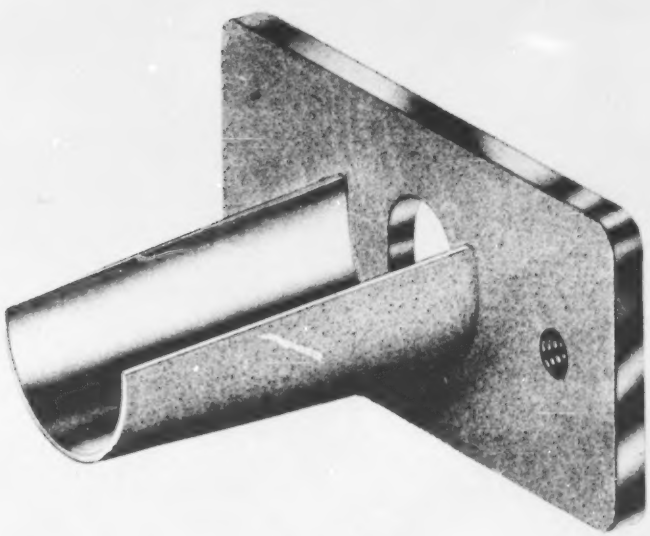


FIG. 10.20
FINISHED RENDERING

XI – TIPS FOR THE CLASSROOM TEACHER
(Potpourri)

* Purchase all one make and model airbrush. This gives an advantage of interchanging parts and keeping extra parts at a minimum.

* Mix paint in amounts of approximately 6 ounces.

* Only use paint or colors recommended for airbrush use. It should say 'for airbrush use' on the tube or jar.

* Filter paint at least every three days.

* Appoint a reliable student to clean or check on the cleaning of each airbrush.

* Be sure to secure CO_2 tanks to something stationary.

* Don't let substitute teachers continue your airbrush lessons. Chances are they are unfamiliar with the instrument and they won't supervise its use properly. Have an alternate lesson prepared in case of absence.

* Purchase airbrushes, hoses, and regulator from the same supplier to insure having the correct fittings.

* Avoid loaning the airbrush overnight.

* Never use hot water to clean the airbrush.

* Purchase an extra tip, reamer, needle, front lever, and hand chuck.

* Keep a daily count of X-acto knives. Although inexpensive, they are apt to be stolen. A block of wood with holes drilled to hold the knives offers a quick check of the number of knives. A back panel should be attached for safety.

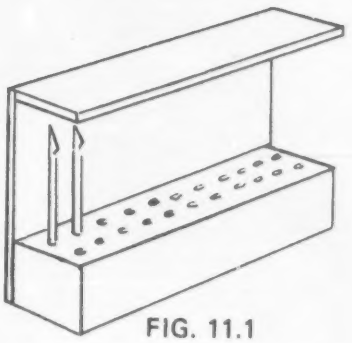


FIG. 11.1

* Don't take the airbrush apart unless absolutely necessary. At the first sign of trouble, check the air pressure, run clean water through, or check the spray regulator.

* If it doesn't spray, remove the handle and check the needle chuck. Sometimes the students forget to tighten the needle chuck when cleaning. Then the needle stays stationary not allowing paint to flow when the front lever is pulled back. If loose, simply tighten until snug.

* If the front lever doesn't depress, check to see if the needle is under the front lever instead of passing through it (Fig. 11-2). If the needle is under the front lever, excessive pressure can break the bottom part of the front lever.

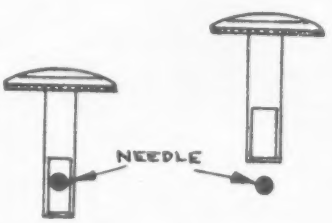


FIG. 11.2

* Don't attempt to enlarge the opening of the spray regulator.

* Use only the reamer in extreme cases or to remove the tip. Do not press too hard when turning it.

* If ordering CO_2 cylinders, a twenty-pound size is recommended.

* Use only CO_2 if using cylinders. Oxygen and many other gases are inflammable or could be dangerous.

* SCUBA tanks use clean, filtered compressed air. This is much more expensive and doesn't last nearly as long.

* Try various types of boards and papers to insure adequate working surfaces.

* If frisket marks show on the board when sprayed, try thickening the paint slightly, then dampen a tissue with 'Bestline' rubber cement thinner, and wipe the marks. The bestline will not smear or harm an airbrushed surface.

* Don't let paint be exposed to dust, dirt, or lint.

* Don't snap the front lever.

* Do not use the matte board as the working surface.

* The airbrush should be attached to the airhose by the instructor as the delicate threads can be easily stripped.

* Keep the spray regulator free from dried color. Remove and clean periodically.

* Avoid using an extremely inexpensive illustration board. When cut into smaller pieces, the cost is amortized greatly. The surface of the inexpensive illustration boards often lift with the frisket paper.

* Never insert anything in the tip; don't pinch or tap it in any way. Only use the method described in Chapter 8 to remove the tip. Do not attempt to remove it or attach it with pliers.

* Avoid bending the point of the needle. If the point bends, straighten carefully by rolling it on a flat surface and gently stroking it with a smooth object such as a ballpoint pen cap until straight.

* Be careful not to cross thread the spray regulator.

* Prepare a drawing on an offset or ditto master for freehand shading.

* The basic rendering exercises may be aided by constructing metal or wooden 3D models with a light source for shading techniques.

* Save errors as well as examples of successful projects for future reference.

* When storing the airbrush for a long period of time, add a few drops of 'Joy' liquid detergent to the water at the last cleaning.

* All freehand cutting and acetate.

* Carefully replace airbrush in the original case or some dustproof container after using (Fig. 11-3).

* Erasing may be done to some extent by scratching the surface with a double edged razor blade.

* Some touching up of light spots may be done with a pointed 1H or 4H pencil. If using this, the student should make dots, not strokes.

FIG. 11.3